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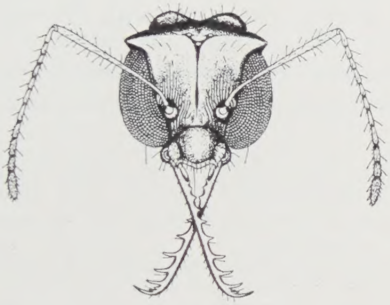

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PSYCHE

Vol. 67 December, 1960 No. 4

A NEW *ACANTHOCTENUS* (ARANEAE: ACANTHOCTENIDAE) FROM JAMAICA, W. I.[1]

By Arthur M. Chickering
Albion College, Albion, Michigan

About twenty-five species are known in this family and all have been assigned to the Genus *Acanthoctenus* Keyserling, 1876. These have been reported all the way from Mexico to Argentina. So far as I have been able to learn, however, no representative has ever been recorded from the West Indies. It is, therefore, of considerable interest to be able to report that both sexes of what I am compelled to regard as a new species have been collected in several localities in Jamaica, W. I. A holotype male and an allotype female have been selected and are described in accord with my usual formula in this brief paper. These types are being deposited in the Museum of Comparative Zoölogy at Harvard College, Cambridge, Mass.

Genus *Acanthoctenus* Keyserling, 1876

Acanthoctenus remotus sp. nov.

(Figures 1-6)

Holotype male. Total length 11 mm. (somewhat exaggerated because of softened and stretched condition of the specimen in the region of the pedicel). Carapace 5.59 mm. long; 4.55 mm. wide opposite second coxae where it is widest; well rounded from opposite posterior eyes to posterior border; median longitudinal thoracic groove deep and long.

Eyes. Eight in three rows, two, four, two; essentially as in the Ctenidae (Fig. 1). Viewed from above, both rows recurved; viewed from in front, anterior row strongly recurved, posterior row moderately recurved in order to produce the characteristic placement. Ratio of eyes AME:ALE::PME:PLE = 14:10::22:22 (measurements taken from borders of the corneas). AME separated from one another by about one third of their diameter, from ALE by slightly more than their diameter. PME separated from one another by about one third of their diameter, from PLE by a little less than their diameter. LE separated from one another by about twice the diameter of ALE (the corneas of these eyes are extended much further than usual). Central ocular quadrangle wider behind than in front in ratio of 10:7, wider behind than long in ratio of 25:22. AME separated from PME by a little more than one third of their diameter. Height of clypeus equal to about the diameter of AME. The clypeus bears 17-18 long slender spines with one isolated on each side dorsal to the base of the cheliceral boss.

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[1] Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

Chelicerae. Nearly perpendicular, slightly divergent, moderately robust. Basal segment 2.275 mm. long. With many long slender spinules extending forward from promargin and many long, curved, light colored hairs at distal end. Basal boss well developed. Fang moderately robust, fairly evenly curved; with three promarginal teeth, the middle one the largest; with three retromarginal teeth of moderate size and gradually diminishing in size from near base of fang distally.

Maxillae. Nearly parallel, moderately robust, only slightly concave in distal half along lateral border. Only slightly more than twice as long as broad. With well developed scopula along medial border to distal tip. Serrula only moderately well developed along distal lateral corner. With many long slender and stiff bristles especially along lateral border.

Lip. Only a little longer than wide in middle; slightly concave along distal border; reaches only slightly beyond middle of maxillae. Sternal suture slightly procurved.

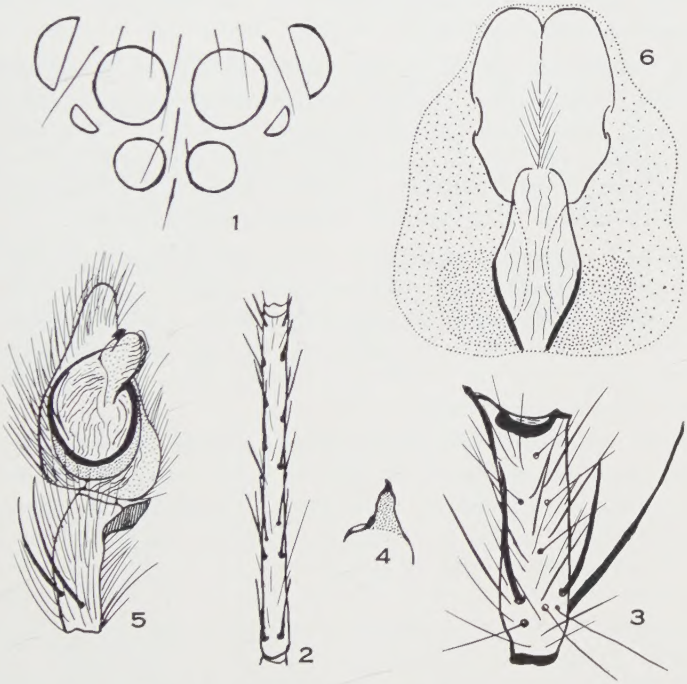
Sternum. Subrotund; as wide as long; slightly pointed at posterior end which is not extended between fourth coxae which are separated by about one fifth of their width. Only slightly scalloped opposite the coxae. Moderately well supplied with slender stiff bristles.

Legs. 1423. Width of the first patella at "knee" .845 mm., tibial index of first leg 6. Width of fourth patella at "knee" .780 mm., tibial index of fourth leg 8.

(All measurements in millimeters)

	Femora	*Patellae*	*Tibiae*	*Metatarsi*	*Tarsi*	*Totals*
1.	8.450	2.795	10.400	9.425	3.250	34.320
2.	7.475	2.600	7.280	7.930	2.795	28.080
3.	5.590	1.820	4.940	6.630	2.405	21.385
4.	8.190	2.275	7.150	9.230	3.315	30.160
Palp	3.120	1.300	1.625	——	2.015	8.160

All trochanters slightly notched ventrally at distal border. Tarsi with two claws, each pectinate in a single row. Trichobothria observed on femora, tibiae, metatarsi, tarsi and on palps. The distribution appears to be irregular, but this has not been carefully enough studied to warrant a precise statement.



Figures 1-6. External Anatomy of *Acanthoctenus remotus.* Fig. 1. Eye group of male; seen from in front. Fig. 2. First tibia; ventral view. Fig. 3. Left palpal tibia; nearly dorsal view. Fig. 4. Left palpal tibial apophysis; lateral view. Fig. 5. Left palpal tibia and tarsus; nearly ventral view. Fig. 6. Ventral view of epigynum.

Spines. There are many prominent spines on the legs but those which seem to be the most distinctive are: First tibia with seven pairs of long, fairly robust, ventral spines (Fig. 2); first metatarsus with ventral spines 0-2-2-2-lr-lr-lp. Second tibia with ventral spines essentially as in first but with more irregularity; second metatarsus with spines essentially as in first but also with more irregularity. Third tibia with three pairs of these robust spines; third metatarsus with ventral spines 0-2-2-2. Fourth tibia with ventral spines 2-2-2; fourth metatarsus with four pairs of ventral spines very irregularly placed. Prolateral and retrolateral robust spines easily confused with ventral spines. Calamistrum apparently absent. Tarsal scopulae well developed on tarsi one and two but less well developed on tarsi three and four. Metatarsal scopulae moderately well developed on metatarsi one and two but absent from three and four. All tarsi with well developed claw tufts.

Palp. Relatively simple; closely similar to that of *A. spinigerus* Kerserling from Central America. Details best shown in Figures 3-5. Tibia with robust distal retrolateral apophysis; with two long slender dorsal spines near proximal end and a similar prolateral spine near proximal end. Patella with dorsal spines as follows: 2-0-1 (extremely long and slender). Hairs on tibia extremely long and stiff.

Abdomen. Somewhat ovate with widest part about one third of its length from posterior end; 5.85 mm. long and 3.575 mm. wide at widest part. With a pair of dorsal depressions a little behind the middle. With three pairs of spinnerets, all short but with anterior pair the largest and the middle pair the smallest. With cribellum obscure and poorly developed.

Color in alcohol. Carapace with a broad, median, nearly uniformly light stripe. On each side of the posterior half of the median thoracic groove there is an elongated dark spot. The whole area lateral to the median light stripe is brownish. Between the PLE there are four narrow stripes formed by light grayish hairs. The chelicerae are irregularly striped with brownish; in front at the outer proximal corner there is a narrow stripe of grayish hairs. Abdomen: the dorsum is brownish, much lighter in the middle in the dorsal half. There is also a group of four light colored tufts of long hairs in the posterior quarter. The whole ventral area, sternum, and venter is uniformly yellowish. The legs are generally brownish dorsally and yellowish ventrally.

Female allotype. Total length 15.08 mm., including the somewhat swollen bases of chelicerae; without the latter 14.625 mm. long. Carapace 6.11 mm. long, 5.20 mm. wide at interval between second and third coxae where it is widest; only slightly sloping from between PLE to about the middle of the well developed longitudinal median thoracic groove from which position it descends steeply to posterior border.

Eyes. Arrangement as in male. Ratio of eyes AME:ALE::PME: PLE = 14:12::20:23 (measurements taken from borders of corneal hypodermis). AME separated from one another by about five sevenths of their diameter, from ALE by about 9/7 of their diameter. PME separated from one another by about their radius, from PLE by about their diameter. Laterals separated from one another by about the long diameter of ALE. AME separated from PME by the radius of the former. Central ocular quadrangle wider behind than in front in ratio of about 5:3.5; wider behind than long in ratio of about 5:4.5. Height of clypeus equal to about 17/14 of the diameter of AME. Clypeus with about 12 long slender spines.

Chelicerae. Nearly perpendicular; parallel, robust, moderately gibbous in front; basal segment 2.6 mm. long. Basal boss well developed. With many stiff bristles in front. Fang and teeth along fang groove essentially as in male.

Maxillae, Lip, and *Sternum.* Essentially as in male.

Legs. 1423. Width of first patella at "knee" .975 mm., tibial index of first leg 9. Width of fourth patella at "knee" .910 mm., tibial index of fourth leg 11.

	Femora	*Patellae*	*Tibiae*	*Metatarsi*	*Tarsi*	*Totals*
	(All measurements in millimeters)					
1.	6.500	3.120	7.410	6.305	2.210	25.545
2.	6.125	2.795	6.110	5.655	1.820	22.505
3.	5.525	2.275	4.485	5.200	1.885	19.370
4.	6.825	2.275	5.850	8.190	2.340	25.480

Trichobothria observed on many segments of legs and palps but their exact distribution has not been determined. Calamistrum short and near proximal end of fourth metatarsus.

Spines. First leg: femur dorsal 0-1-1-1, prolateral 0-1-1-0, retrolateral 0-1-1-0-1-1-1-0, ventral with numerous spines irregularly placed and difficult to describe significantly; first tibia with nine pairs of ventral spines; first metatarsus with five pairs of what may be termed ventral spines but most of them are moved into a somewhat lateral position. The second tibia has seven pairs of spines and the second metatarsus five pairs, all similar to those on first leg. All legs are provided with numerous stout spines. The palpal claw is simple with four moderately robust teeth.

Abdomen. Regularly ovate; cribellum moderately well developed; clearly divided. Otherwise essentially as in male.

Epigynum. Essentials as shown in Figure 6.

Color in alcohol. Essentially as in male except as herein noted. Carapace more clearly striped than in male; on each side of the median light stripe there is a broad darker stripe and on each an additional light marginal stripe thus making five broad stripes on the carapace.

Type locality. Holotype male from St. Andrew, Upper Mountain View, January 15, 1950 (C. B. Lewis). Allotype female from St. Andrew, Cross Roads, December 3, 1950 (R. P. Bengry). The following specimens are also in the collection: One paratype male from St. Andrew, Upper Mountain View, May 15, 1950 (C. B. Lewis); one paratype female taken with holotype male; another female from St. Andrew, Upper Mountain View, February, 1951 (C. B. Lewis) and two females from St. Andrew, Half-Way Tree, October 18, 1950 (R. P. Bengry). The author of this paper took one immature female in Hope Gardens, near Kingston, June, 1954.

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TECHNIQUES FOR THE STUDY OF ANT LARVAE

By George C. Wheeler and Jeanette Wheeler
University of North Dakota, Grand Forks

Our studies on ant larvae have been published in 30 separate articles scattered in eight periodicals, appearing over a period of 33 years. Several entomologists have expressed regret that the studies have not been combined into a monograph. We regret this too, but no foundation has been willing to publish so long a treatise with so many illustrations and without economic or popular appeal, and no journal has been willing to accept it on the installment plan. The exigency of finance, then, has forced us to publish the body of the "monograph" piecemeal. This present article can be regarded as a part of the introduction. We are prompted to publish it at this time by requests for information concerning our techniques.

Living Material

When living larvae are available, we observe and record as much as possible of their external anatomy. If the larvae are active the changeability of form is noted.

Preservation

Any preservative may be used for ant larvae if only the external anatomy is to be studied. We prefer 85% ethyl alcohol. No special preparation is necessary; the larvae are simply dropped into the preservative. If the alcohol is too dilute or if the container has been overcrowded internal structures may be inadequately preserved, but the integument will still be usable for external anatomy. If large larvae are jostled the hairs may get broken.

Naturally if one plans to investigate also internal anatomy or histology, appropriate killing and fixing reagents are necessary.

If we have only one larva (or very few) of a species we make notes and drawings before subjecting it to any additional techniques. This is simply good insurance.

Relaxation

Even dried larvae may be used for the study of external anatomy. Either of two methods of relaxing is recommended:

1. Two days in a 0.5% solution of trisodium phosphate. Transfer to 85% alcohol.

2. Two days (or less) in the following — 95% ethyl alcohol 280 ml; distilled water 230 ml; benzol 35 ml; ethyl acetate 95 ml.

Dried larvae are handled with extreme care, since hairs are more likely to get broken in this condition.

Handling

The most convenient receptacle for the treatment of larvae is a staining dish (= embryological cup) 41 x 41 x 18 mm in outside dimensions. Minute specimens, however, are best treated in culture slides (= hanging-drop slides). Small specimens are transferred with a pipette, larger specimens between the points of forceps (but without compression). Or, if one prefers, the larvae may be left in the same dish or culture slide; the old reagent is drawn off with a pipette and then replaced with the next reagent.

Cleaning

The best cleaning reagent is potassium hydroxide solution (10 gm KOH in 90 ml water). While still in preservative the larvae are punctured with a dissecting needle or minute insect pin on the right side to permit the ready penetration of the cleaning solution. The number and locations of the punctures and the size of the needle depend upon the size of the larva. The specimen is left in the cleaning solution until all the internal tissues are dissolved and only a transparent exoskeleton remains.

If cleaning is not complete by the end of two days, the following procedure may prove effective: transfer to 1% hydrochloric acid and leave 15 minutes; 15 minutes in 95% alcohol; then leave in KOH until clean. Some larvae contain droplets of opaque substances which are insoluble in KOH; these usually disappear later in alcohol or xylol.

Staining

The exoskeletons of ant larvae are stained in a very dilute solution of acid fuchsin. We use the following formula as a stock solution: acid fuchsin 0.1 gm, concentrated hydrochloric acid 1 ml, distilled water 1 liter; a few thymol crystals are added to prevent mold. The cleaned exoskeletons are washed in water for 15 minutes and transferred to 2 ml of 1% HCL in a staining dish; five drops of the stock solution of acid fuchsin are added. The integuments are left in the stain for 12 hours. We have experimented with stronger solutions of stain for shorter periods but have not been satisfied with the results.

If overstained the integument can be completely decolorized by leaving it in a 1% solution of potassium hydroxide for several hours. It can then be washed and restained.

Dehydration

After staining, the exoskeletons are transferred to 95% alcohol (about 3 ml), in which they remain for about an hour. At the end of this period eight drops of carbolxylol (= 3 parts xylol and 1 part melted phenol crystals) are added every five or ten minutes until 48 drops have been added to the alcohol. If the carbolxylol is added too rapidly the exoskeletons may collapse and become distorted; they can be restored by transfer to 95% alcohol. If oil droplets separate from the alcohol, too much water has been carried over from the stain; the integuments are transferred to fresh 95% alcohol.

Clearing

From the mixture of carbolxylol and alcohol the integuments are transferred to pure carbolxylol and left for 15 to 60 minutes; then to xylol in a culture slide (or if large, in a staining dish). Add a drop of thin Canada balsam every 15 minutes, allowing the xylol to evaporate meanwhile.

Mounting

When the balsam in the culture slide attains the same consistency as that which is being added, a large drop of the latter is placed on a slide and the exoskeleton is transferred to it. At this time medium to large specimens are surrounded — or at least flanked — by supports of some sort. We use fragments of broken slides which are of about the same thickness as the depth of the specimen. If it is obvious that the exoskeleton will not remain in the desired position, supports (such as a fine glass rod or fragments of cover slip) may be placed under the low part.

Positioning

With needles *dipped in xylol* the integument is now arranged in the proper position for drawing (discussed below). Since the balsam must be soft at this stage, the specimen will rarely remain in precisely the desired position; hence the slide is allowed to rest flat in a covered container (e.g., a petri dish) for 24 hours.

If the specimen then needs rearranging, this is done under a stereomicroscope with needles *dipped in xylol.* If the balsam is too firm a drop of xylol is put on it and let stand a few minutes before using needles. If it is apparent that the specimen will not remain in the desired position, supports (fine glass rods or fragments of cover slip) may be inserted at this time. If supports were placed earlier, they may need readjustment. Shifting the retaining walls will sometimes correct the position of a specimen. After the rearrangement is completed more balsam is added if necessary to cover the specimen.

It is sometimes necessary to rearrange a specimen on half a dozen successive days. Once a specimen has remained in the desired position for 48 hours and is completely covered with balsam, the technique is considered finished.

If material is abundant we regularly make two kinds of mounts of each size and caste of each species: (1) an entire exoskeleton in side view; (2) detached head in full-face view, with the remainder of the exoskeleton ventral side up (or, if the head is applied to the ventral surface, the whole exoskeleton ventral side up). Other kinds of mounts are made whenever necessary.

For a side view an entire exoskeleton with the left side up and in strict profile, i.e., the middorsal line, the midventral line, the middle of the anus and the middle of the labium are all in the same plane. A good check is to be sure that the left spiracle of each somite is directly above the right spiracle of the same somite. It is conventional to show the entire larva viewed from the left side. Actually it doesn't matter which side is up. If for any reason (e.g., damaged left side) an integument is mounted with the right side up, it is a simple matter to reverse the original drawing.

The exoskeleton of the head is mounted in full-face (i.e., anterior) view. To accomplish this the uppermost line (imaginary) of the occipital border is set in the same plane as the lowermost part of the ventral surface of the labium.

When the head is applied to the ventral surface of the body (i.e., no neck), it is often possible to get it in the correct position by mounting an entire integument ventral side up. In most genera, however, it is necessary to cut off the head (either alone or with a portion of the prothorax) and mount it separately.

It is often necessary to prop up the ventral part of the head on fragments of cover slip, but only very large heads require retaining walls.

After the head is removed, the remainder of the integument is mounted with the ventral side up by following the procedure for the entire integument (see above).

Covering

It is not, however, necessary to cover a mount if it is to be studied at low magnifications. In fact, covering is avoided whenever possible; if the balsam is soft (and it may take years for the interior of a thick mount to harden), the weight of the cover slip will set up currents which are likely to move the specimen out of the desired position.

If, however, the specimen must be studied under the high power objective (X440) of a microscope, a cover slip is essential. For study under an oil immersion objective (X970) the part of the integument is detached, flattened and covered.

If a cover slip is required on a thick mount, it may be added at any time after the surface of the balsam is hard. A drop of xylol is put on the surface and a large drop of thin balsam is put on a cover slip. The cover slip is inverted and one edge is rested on the balsam mount; the opposite edge is supported by a dissecting needle while it is slowly lowered into position. The cover slip is then adjusted by needles dipped in xylol.

If material is scarce — and especially if there is only a single larva — low-power studies are completed before the mount is covered. When material is abundant both covered and uncovered mounts are prepared.

Reversibility

It is reassuring to realize that, *after the integument has been cleaned,* every step is reversible. The same may be said of any series of steps and even of the entire technique from cleaned exoskeleton to covered slide mount. Only one precaution is necessary: hydration (i.e., from 95% alcohol to stain) must be gradual.

Perfectionism

The most important advice we can give to beginners is to avoid perfectionism in making mounts of ant larvae. Not only is perfectionism harmful to the technician (frustration, waste of time), but it can be very damaging to the material. Whenever the conscientious worker has an almost-good-enough preparation, there is always the temptation to try to adjust it a little bit more. Since the balsam must be a little thicker than usual to hold the specimen in the new position, the risk of damage is therefore proportionately increased and the damage may well be irreparable.

It is far better to stop short of perfection in mounting and resort to correction of the position of the slide. Before drawing we make any slight correction that may be necessary by propping up an edge or a corner or an end of the slide on a small lump of plasticine.

Storage

Prepared slides of ant larvae are always stored flat in the horizontal position. To store on edge is to risk displacement of the specimen, since the interior of a thick balsam mount requires years to harden. Thin mounts may, of course, be stored in any position as soon as the edges of the cover slip are sealed.

Preserved larvae may be stored indefinitely in 85% alcohol. The only precaution required is to prevent drying by evaporation through a faulty seal. (Dried larvae may be relaxed by methods given above.)

Summary of Technique

1. Puncture integument
2. 10% KOH until clean
3. Distilled water — 15 minutes
4. Transfer to 1% HCL
5. Add 5 drops acid fuchsin; leave 12 hours
6. 95% alcohol for an hour
7. Add carbolxylol gradually
8. Carbolxylol 15-60 minutes
9. Xylol
10. Add thin balsam gradually
11. Transfer to balsam on slide
12. Arrange in desired position
13. Examine daily; rearrange as often as necessary until desired position has been maintained for 48 hours

Descriptions

We have generally followed this plan in writing our specific descriptions of ant larvae: body shape; leg vestiges; spiracles; integument; body hairs; head shape; antennae; head hairs; labrum; mandibles; maxillae; maxillary palp; galea; labium; labial palp; opening of sericteries; hypopharynx. To facilitate taking notes we have prepared and used a mimeographed form with a blank space under each of the above headings.

When a larva is to be described the prepared slides are studied under a stereomicroscope for low magnifications and a microscope for high magnifications.

Measurements are made by comparison with the squares of an eyepiece reticule (= net micrometer) which has been calibrated with a stage micrometer.

Drawings

All our drawings of ant larvae are made with the aid of a microscope. A reticule (= net micrometer) is placed in the eyepiece. This superimposes a grid of squares on the image of the object. The drawing of the object is made on coordinate paper. The size of squares used is determined by the desired enlargement of the drawing. If coordinate paper is not available or if the squares are not of the desired size, it is not difficult to construct a coordinate grid on plain paper.

When the eyepiece grid is properly placed with reference to the image and the coordinate system is established on the paper, we are ready to start drawing.

The dimensions and proportions of the drawing are established by short marks across the lines of the coordinate system in the appropriate places. The main outline is constructed by joining these intersections with freehand lines. Structures inside or outside the main outline are treated in approximately the same way, but more freehand drawing is required because fewer squares are involved and smaller parts are likely to be wholly inside a single square. It is not necessary to complete all fine details at this stage.

The drawing is placed on a tracing table, a sheet of thin drawing paper (e.g., Ledger Linen) is laid on it; the drawing is copied onto the drawing paper in India ink with curve-pen (Keuffel and Esser). Finer details are drawn with a Hunt Mapping Pen No. 104.

In the case of bilaterally symmetrical structures (e.g., head in anterior view) only one half is drawn, with a vertical matching line down the middle. After this half (but not the matching line) has been inked the pencil drawing is turned over on the tracing table, matched up to the first half and then inked.

Most of our drawings are orthographic projections of opaque objects (even though the integuments studied are actually transparent). Only structures on the near side of the plane of the outline are drawn. For example, in a side view of a larva the outline represents the imaginary middorsal and midventral lines; hairs and other parts attached beyond (= below, in the field of the microscope) the plane of these two lines are not shown. To our rule of assumed opacity a few exceptions are made, e.g. dark-colored structures overlaid by translucent tissues.

We have found 120 mm to be a convenient length for a drawing of the entire larva. The plane of projection includes the middorsal line (imaginary), the midventral line (imaginary), the middle of the anus and the middle of the bottom of the labium. It is conventional to view the larva from the left. But if for any reason it has been drawn from the right, the original drawing (on co-ordinate paper) can be turned over on the tracing table before inking.

The head is drawn in full-face (i.e., anterior) view. The plane of projection passes through the uppermost line (imaginary) of the occipital border and the lowermost part of the ventral surface of the labium. A convenient width (at the widest place) is 75 mm.

The mandible is also drawn in anterior view. The plane of projection passes through the apex, the inner (= medial) condyle and the outer (= lateral) condyle. If the mandible is drawn from a head mounted for full-face view, it is usually necessary to prop up an edge of the slide to bring these three points into the same horizontal plane. A convenient length for the mandible drawing is 65 mm.

THE FEMALE OF *LUCARACHNE BEEBEI* GERTSCH (ARANEAE: SYMPHYTOGNATHIDAE)[1]

By Arthur M. Chickering
Albion College, Albion, Michigan

Miss Elizabeth B. Bryant established the genus *Lucarachne* in 1940 on the basis of both males and females taken in Oriente Province, Cuba, at 1500 feet elevation. She placed the genus, with some hesitation, among the Metinae of the Argiopidae and noted that it appeared to be closely related to *Theridion cidrelicola* Simon from Venezuela, the male of which is now considered to belong to the genus *Lucarachne* and is included in the Family Symphytognathidae. When Dr. Gertsch (1960) described *L. beebei* from males alone he noted that four species of the genus *Lucarachne* are now known as follows: *L. tibialis* Bryant from Cuba; *L. cidrelicola* (Simon) from Venezuela; *L. beebei* Gertsch from Trinidad; *L. palpalis* Kraus from Honduras and Mexico. Dr. Gertsch has recently identified a male *L. beebei* Gertsch from my Panamanian collection of 1936 taken in El Valle. In my collection made in Panama in 1958 numerous specimens of both males and females of this last-named species were found also near El Valle. One of the females has been selected and is described below in accord with my usual procedure.

Genus *Lucarachne* Bryant, 1940
Lucarachne beebei Gertsch

Female. Total length 2.05 mm. Carapace 1.012 mm. long, .85 mm. wide opposite interval between second and third coxae where it is widest; well rounded along margin from opposite posterior eyes to posterior border; gently arched from PE to near posterior border with highest part shortly behind those eyes; with few bristles or hairs.

Eyes. Eight in two rows. Region of AME considerably raised into a low blunt tubercle. Seen from above, posterior row nearly straight, anterior row strongly recurved; seen from in front, anterior row slightly procurved, posterior row strongly so, all measured by centers.

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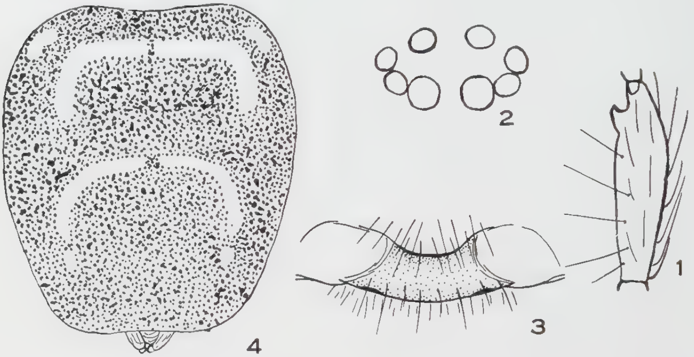
[1] Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

Ratio of eyes AME:ALE::PME:PLE = 10:6::6:7. AME separated from one another by about three fifths of their diameter, from ALE by only a line. PME separated from one another by about five sixths of their diameter, from PLE by about the same distance. LE almost in contact. Central ocular quadrangle wider in front than behind in ratio of about 6:5; nearly as long as wide in front. Clypeus very high; height equal to nearly three times the diameter of AME.



Figures 1-4. External Anatomy of the Female of *Lucarachne beebei* Gertsch. Fig. 1. Left first femur; nearly ventral view. Fig. 2. Eye group of female; somewhat obliquely from above. Fig. 3. Epigynum, from below. Fig. 4. Abdomen; posterior surface.

Chelicerae. Moderately robust, vertical, parallel; fang regularly curved; promargin of fang groove apparently with three teeth the first of which is only a denticle while the other two are fairly robust; retromargin with only one rather small tooth.

Maxillae. Robust; slightly convergent.

Lip. Reaches about two thirds the length of the maxillae. Sternal suture only slightly procurved.

Sternum. Scutiform in general; quite convex; only slightly longer than wide; widest opposite interval between first and second coxae; extends between fourth coxae and terminates in a blunt truncature; fourth coxae separated by nine tenths of their width; posterior end with a cluster of stiff bristles.

Legs. 1243. Width of first patella at "knee" .132 mm., tibial index of first leg 9. Width of fourth patella at "knee" .110 mm., tibial index of fourth leg 10.

	Femora	*Patellae*	*Tibiae*	*Metatarsi*	*Tarsi*	*Totals*
	(All measurements in millimeters)					
1.	1.275	.422	1.000	.715	.620	4.032
2.	1.150	.390	.785	.715	.520	3.560
3.	.910	.325	.585	.484	.484	2.788
4.	.970	.340	.715	.715	.585	3.325

Legs with many long slender stiff bristles and few definite long slender spines the most significant of which appear to be the following: each patella with two of these dorsally placed, one near each end of the segment; each tibia has one of these on the dorsal surface near the proximal end; numerous extremely slender spines occur more or less in rows on the ventral surfaces of the femora. The first femur has a distinctive ventral apophysis near the distal end (Fig. 1). Trichobothria are present on the tibiae and metatarsi but the exact numbers and distribution have not been determined.

Abdomen. Ovoid; carried in nearly a perpendicular position; overlaps the carapace considerably; similar to that of *L. palpalis* Kraus (Fig. 4).

Epigynum. Simple; details best shown in Figure 3.

Color in alcohol. Essentially as described for the male by the author of the species; exposed posterodorsal surface essentially as shown in Figure 4.

Collection records. Dr. Gertsch had the male holotype and one male paratype from Trinidad. Collection records in Panama are as follows: a single male from El Valle from my collection of July, 1936, recently identified by Dr. Gertsch; several specimens of both sexes are included in my collection of 1958; these were taken about five miles south of El Valle in January.

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STUDIES ON NORTH AMERICAN CARBONIFEROUS INSECTS 1. THE PROTODONATA[1]

By F. M. Carpenter
Harvard University

Introduction

This is the first of a series of papers based upon insects from Carboniferous strata in North America. The studies will be concerned in the main with previously described specimens (mostly types) in the Museum of Comparative Zoology, the U. S. National Museum and the Peabody Museum at Yale University, but will include new material whenever it is available.

Order Protodonata

Up to the present time only three species of Protodonata have been described from North American deposits of Carboniferous age. The present paper includes the description of a fourth species and an account of the previously described ones. In addition, I have included a discussion of the status of the ordinal name Protodonata.

One of these protodonates belongs to the family Meganeuridae and another to the Paralogidae. The remaining two are best referred to Incertae Sedis for family designation, although their protodonate affinities are unquestionable.

Family Meganeuridae

Typus durhami, n. sp.

Plate 11; text figure 1.

Forewing: greatest length of preserved part, 88 mm.; estimated complete length, 175 mm.; maximum width of preserved part, 27 mm. The venational details of both fore and hind wings, so far as preserved, are shown in text figure 1. The general venational pattern is close to that of *permianus* and other known species of the genus. The cells of the wings are larger than those of *permianus,* especially in the area between MA and CuP; R2+3 and R4+5 seem to diverge even more gradually in *durhami* than in *permianus.* The basal origin of

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[1] This research was supported by National Science Foundation Grant No. NSF G 14099, and the article is published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

R3 is not preserved in the fore wing but in the hind wing it is clearly visible and is associated with the oblique cross-vein (Sn) characteristic of most Meganeuridae (Carpenter, 1947, p. 47); the cross-vein is not so pronounced as it is in *permianus,* however. The differences between the fore and hind wings in the proximal region are like those in other species of *Typus.*

Holotype: U. S. National Museum, Washington, D. C.[2] The specimen (field number 8758) was collected in May, 1939, by Mr. Charles B. Read at Durham, Georgia, the locality data being "Catoosa (TVA. Durham Quad.), Williams Coal Company Mine in No. 4 Coal. Plants from roof shale." According to Butts' account of the stratigraphy of the Paleozoic area in northwest Georgia (Butts and Gildersleeve, 1948, pp. 54-56), the coal mines at Durham are in the Walden sandstone part of the Pottsville Series. Butts states that "according to the best knowledge, the Pottsville Series of Georgia is of Lower Pottsville age and falls within the limits of the Lee Conglomerate of Tennessee and Virginia and corresponds approximately to the lower part of the Pottsville of the anthracite coal fields of Pennsylvania which carry the Lykens number 4 and 5 and the Lykens Valley coals." A brief discussion of the nature of the no. 4 coal at Durham is contained in Gildersleeve's account (ibid., 1948, p. 104) of the mineral resources of the Paleozoic area in northwest Georgia.

As can be seen from the photograph (Plate 11), the specimen consists of the apical portions of the fore and hind wings; although the remainder of the insect, which was presumably originally preserved, is broken away, the preserved portions are very clear. I have assigned this species to the genus *Typus* but it might conceivably belong to *Megatypus* or *Boltonites;* the absence of the basal part of the wing containing the regions of the anal crossing and the second anal vein prevents a more definite generic assignment.

The interest attached to this species is in the evidence which it provides for the existence of the Meganeuridae in North America during the Carboniferous. It is the first such fossil that can be definitely assigned to the family. Furthermore, *Typus durhami,* occurring in the Lower Pottsville Series (corresponding approximately to Westphalian A), is among the oldest fossil insects known from North America.

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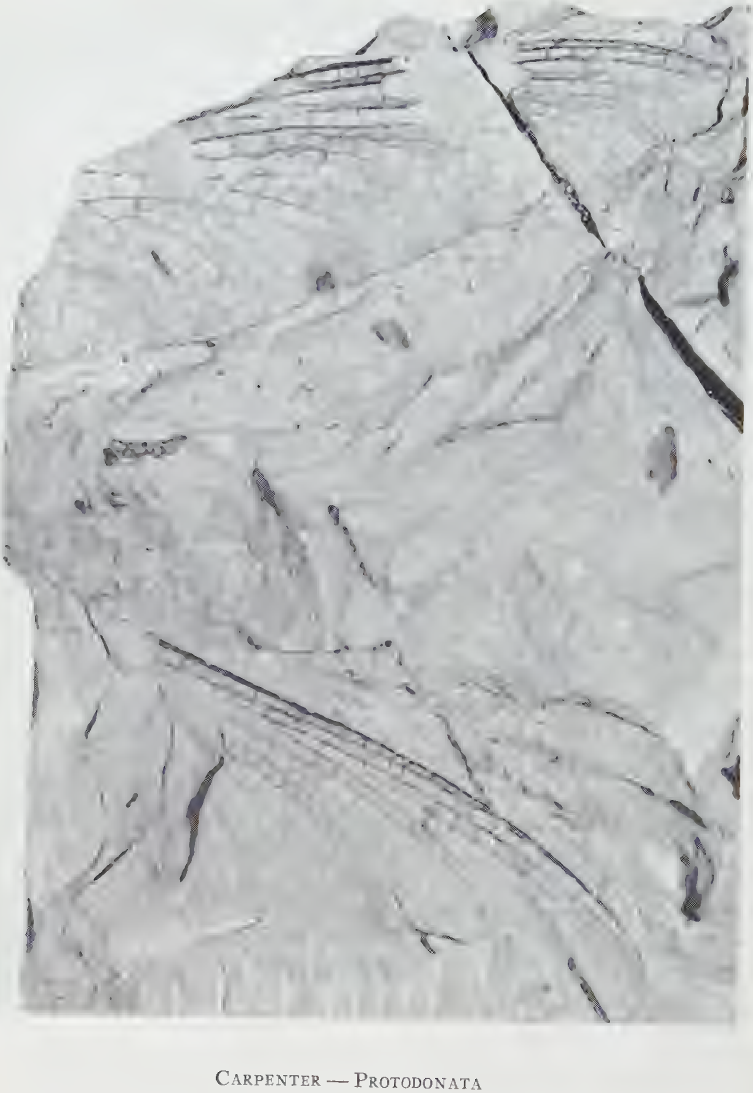
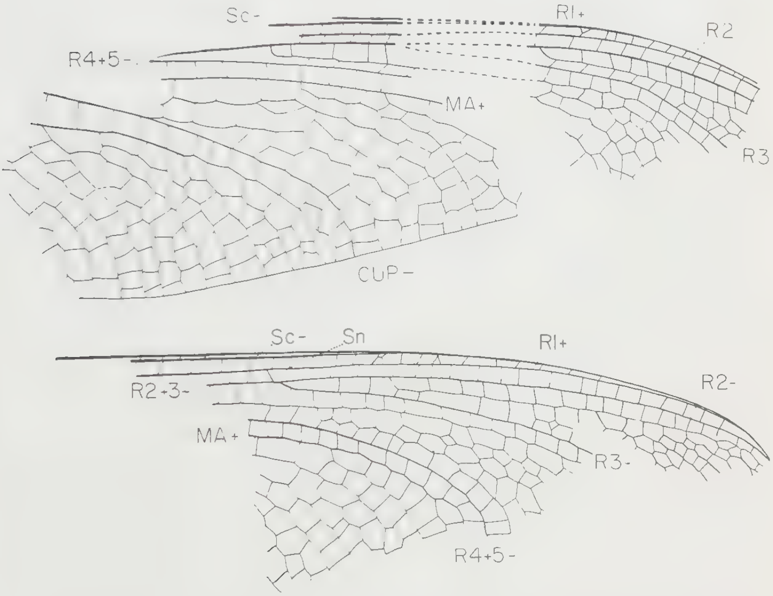
[2] I am indebted to Dr. S. H. Mamay of the United States Geological Survey for sending me this specimen for study.



Carpenter — Protodonata

Family Paralogidae

The distinctive features of this family are the short subcosta, which terminates just beyond the middle of the wing; and the widely divergent branches of Rs (R2 + 3 and R4 + 5). The complete absence of the apparent vestige of CuA may also be a family trait. *Paralogus* is the only Carboniferous genus that clearly belongs here but in my opinion the Permian genus *Oligotypus* Carp. does also. Fraser (1957) considered *Oligotypus* to be a meganeurid, but, as shown below, his concept of the Paralogidae has not been entirely correct. *Oligotypus* differs from *Paralogus* only in minor details: the wing is somewhat more slender, and the branches of MA and 1A arise as a series of irregular veinlets, instead of distinct branches as in *Paralogus*. The following review of the structure of *Paralogus* strengthens my conviction that it and *Oligotypus* belong to the same family.



Text figure 1. Drawing of *Typus durhami*, n. sp. (holotype), fore and hind wings. Sc, subcosta; Rs, radius; R2, R3, R4+5, branches of radial sector; MA, anterior media; CuP, posterior cubitus; Sn, subnodal vein.

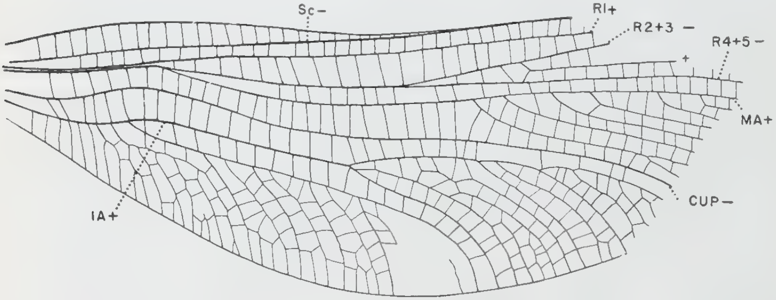
EXPLANATION OF PLATE 11

Photograph of *Typus durhami*, n. sp. (holotype) × 11/10.

Paralogus aeschnoides Scudder
Text figure 2.

Paralogus aeschnoides Scudder, 1893, U. S. Geol. Surv., Bull. **101**: 21; pl. 1, fig. a.

The unique specimen on which this species was based was collected by Mr. F. P. Gorham (1889) in Upper Carboniferous rocks at Silver Spring, East Providence, Rhode Island, and was donated to the Museum of Comparative Zoology by Professor Gorham in 1932. It consists of a well-preserved wing, about two-thirds complete. Scudder's drawing of the fossil is good and even shows by means of shading the convexity and concavity of the veins. I have included here a new description and an original illustration of the fossil, in part because a few details of phylogenetic significance were not clearly indicated by Scudder and in part because Dr. Fraser's recent illustration of the fossil (presumably based on Scudder's drawing) is misleading in several important respects.



Text figure 2. Drawing of *Paralogus aeschnoides* Scudder (holotype). Lettering as in text figure 1.

The wing fragment, as preserved, is 54 mm. long, and has a maximum width of 19 mm.; the complete wing was probably about 80 mm. long. The subcosta terminates a short distance beyond the middle of the wing and beyond the point of separation of R2 + 3 and R4 + 5. The two latter veins diverge widely after their origin; MA has a series of pectinate branches beginning just beyond the divergence of R2 + 3 and R4 + 5; just before the level of this divergence, 1A separates into a divergent fork and sends a series of additional branches towards the distal part of the wing.

The wing itself is broad for a protodonate and has a strongly curved posterior margin. However, on the basis of our knowledge of the differences between the fore and hind wings of Meganeuridae, I believe that the specimen of *aeschnoides* is a fore wing. At any rate, the distance between the posterior margin of the wing and the first anal is like that of other protodonate fore wings, not hind wings.

As can be seen from Scudder's illustration, the wing was subjected to some distortion in the process of preservation; it rests on a very uneven surface of the rock, so that the contour of the anterior margin of the wing is difficult to follow exactly. This is made worse by the presence of a slight "fault" extending obliquely across the wing, so that the veins in the anterior part of the wing are not quite aligned on the two sides of the fault. The result of the faulting and of the irregularity of the surface of the rock is to cause a more pronounced curvature of the anterior margin of the wing than would presumably otherwise have been present. The drawing in text figure 2 has been made without any attempt to restore the presumed original shape of the wing, apart from aligning the veins across the fault.

Scudder's representation of the shape of the wing is correct, the proportions of his drawing being approximately the same as those in the fossil. On the other hand, Fraser's drawing (1957, figure 11), showing a markedly broad wing and strongly curved posterior margin, is apparently incorrect. At any rate, I do not know of any evidence which supports this conception of the wing. Two other, more minor, corrections in Fraser's figure should be noted. The vein which he has labelled R3 is a convex intercalary vein; R2 and R3 presumably separate much further along the wing. Also, the subcosta terminates gradually somewhat beyond the level of the separation of R2 + 3 and R4 + 5, not abruptly before this level as shown in Fraser's drawing. The short basal vein, termed CuA, which is consistently present in the meganeurids, is not discernible in the specimen of *aeschnoides* although Dr. Fraser has shown it in his drawing. The absence of this vein appears to be another characteristic shared by *Paralogus* and *Oligotypus*.

The deposit in which the specimen of *aeschnoides* was found is usually referred to the Allegheny or Conemaugh Series, about equivalent to the Upper Westphalian of Europe.

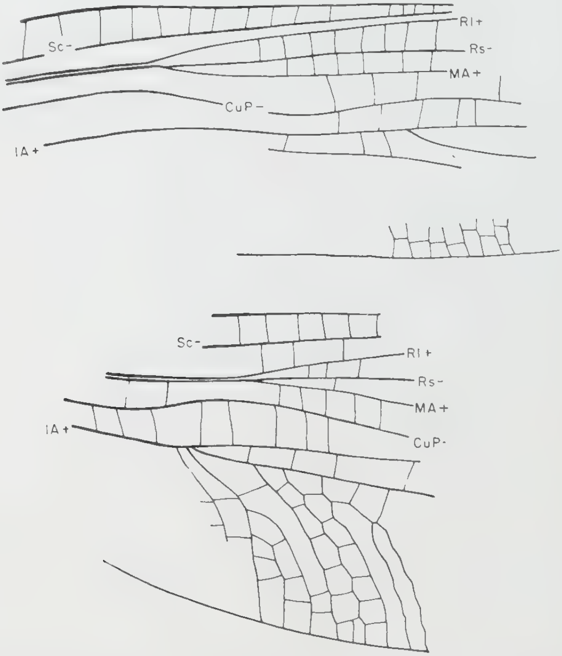
Family: Incertae Sedis

Paralogopsis longipes Handl.

Text figure 3.

Paralogopsis longipes Handl., 1911, Amer. Journ. Sci., (4) 31: 374, fig. 58.

The specimen on which this species was based is contained in an ironstone nodule from the vicinity of Mazon Creek, Illinois; the type is in the Peabody Museum at Yale University, where I examined it several years ago. Although Handlirsch figured only the hind wing (so far as it was preserved), a portion of the fore wing is also present; this is clearly narrow, more like that of the Meganeuridae than of the Paralogidae, where *Paralogopsis* has previously been placed (Fraser, 1957). However, since the key parts of the wings (such as the forking of Rs) are not included in the preserved portion, the family relationships remain obscure.



Text figure 3. Drawing of *Paralogopsis longipes* Handl. (holotype). Lettering as in text figure 1.

The significance of this fossil is that it provides the only record of the Protodonata in the Carboniferous strata of the Eastern Interior Region of North America. The Frances Creek shales, which yield these ironstone nodules, are considered part of the Carbondale Formation; this is regarded as about equivalent to the middle or late Westphalian stage (late C or early D) of Europe.

Palaeotherates pennsylvanicus Handl.

Text figure 4.

Palaeotherates pennsylvanicus Handlirsch, 1906, Proc. U. S. Nat. Mus., **29**: 690, fig. 17.

Palaeotherates pensilvanicus [sic] Handlirsch, 1906, Fossilen Insekten: 311; pl. 32, fig. 5.

The fossil on which this species was established consists of a wing fragment preserved in black shale; it was collected in 1887 in interconglomerates, at Coxton, one mile north of Pittston, Pennsylvania. The type specimen, which is in the U. S. National Museum (No. 38787), was kindly loaned to me for study through the courtesy of Dr. G. A. Cooper.

Handlirsch's drawing of the fossil, although correctly representing the general venational features, omitted two significant details, — the subnodal vein and the costa. He recognized that the "second vein" must be the radius (R1), but since he could detect no anterior vein, other than a marginal one, he concluded that the subcosta had fused with the costa in the area of the wing preserved. However, the clear preservation of the subnodus (Sn), which Handlirsch did not figure, shows that the part of the wing represented was too near the middle of the wing for the termination of the subcosta to have taken place. Furthermore, careful study of the fossil shows that the anterior margin of the wing (costa) is actually present as distinct from the subcosta in the distal part of the fossil, although it is broken away along the rest of the wing fragment. It now becomes clear that the fossil represents a fragment of the wing just beyond the middle; it includes the point of separation of R2 and R3, but not the separation of R2 + 3 and R4 + 5. Handlirsch's naming of the veins is incorrect; the convexities and concavities, which are clearly preserved in the fossil, show that R4 + 5 was included in the complex which he termed the media.

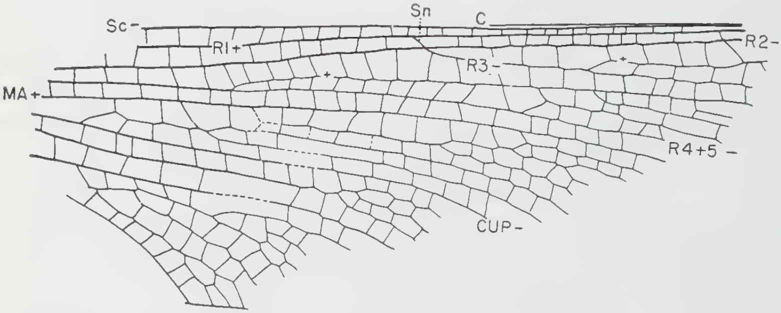
The original insect was probably about the size of most species of *Typus*, not "very large" as estimated by Handlirsch. The wing fragment is 45 mm. long, and on the basis of comparisons with other protodonates, it probably represents about one-third of the complete wing. Since the width of the wing of *pennsylvanicus* is 18 mm., its original dimensions were probably close to those of *Typus gracilis* Carp. (Permian), which is 145 mm. long and 26 mm. wide.

The drawing of the fossil shown in text figure 4 is based on the type specimen. The venational pattern, so far as it is known, is like that of the meganeurids, but, since the proximal half of the wing is unknown, I consider the family position uncertain. It is clearly not a member of the Paralogidae, where it was placed by Fraser (1957).

The deposit in which this fossil was collected appears to be of upper Pottsville age corresponding to Westphalian C of the European classification.

Status of the Ordinal Name Protodonata

I take this opportunity to discuss the status of the ordinal name Protodonata, in an attempt to clear up some of the confusion which has appeared in the literature in recent years. Handlirsch (1906b) first defined this group as an order in 1906[3] and he placed here three new



Text figure 4. Drawing of *Palaeotherates pennsylvanicus* Handl. (holotype). Lettering as in text figure 1.

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[3] Much confusion has resulted from two, almost simultaneously published works by Handlirsch, both appearing in 1906. His *Revision of American Paleozoic Insects* (Proceedings of the U. S. National Museum, Vol. 29, pp. 661-820) is an English translation of a specially prepared account of the Paleozoic insects then known from North American deposits. New species, genera and higher taxa were described and illustrated. His *Die Fossilen Insekten* was published by Englemann in Leipzig in parts over a period of two years. The first part, consisting of pages 1-640, was published in 1906 (See *Fossilium Catalogus*, (I), Pars 16, 1922, p. 10). This part dealt with the Paleozoic insects and included, among the others, descriptions and figures of the North American fossils. That this work was published *after* the English account is shown by the references in *Die Fossilen Insekten* to specific pages in the Proceedings article. Unfortunately, many (but not all) of the species, genera and higher taxa already described in the Proceedings account were described again and designated as new in the larger, German treatise.

In reality, the first designation of the Protodonata as an *order* was made in the Proceedings article mentioned above. The discussion of the characteristics of the order was essentially that given later in *Die Fossilen Insekten*, but only two genera, *Paralogus* and *Palaeotherates*, were actually mentioned as included in the order.

families: Protagrionidae Handl., Meganeuridae Handl., and Paralogidae Handl. The Protagrionidae[4] were known only from a single wing *(Protagrion audouini)*, but the Meganeuridae were known from many specimens, some of which included the body structures. Handlirsch's definition of the order was accordingly based on the meganeurids and the order itself was considered by him to be related to both the Paleodictyoptera and the Odonata. In the course of several years, as more meganeurids and Paleodictyoptera were found, it became increasingly evident that the Protagrionidae were not at all closely related to the Meganeuridae or to the Odonata. In 1932, Martynov (1932a), after pointing out the differences between these two groups, removed the Meganeuridae and Paralogidae from the Order Protodonata and placed them in a new order which he erected for them, the Meganisoptera. The Order Protodonata was therefore left with the family Protagrionidae, which was then recognized as having no odonate affinities.

In 1943, after a detailed study of the original specimen of *Protagrion audouini* (preserved in the Paris Museum), I published an account of this fossil and transferred the family Protagrionidae to the Paleodictyoptera, where it clearly belongs, in association with several related families; at the same time I restored the Meganeuridae and Paralogidae to the Order Protodonata, as they were originally placed by Handlirsch.

In 1957, in his account of the classification of the Odonata (p. 21), Fraser agreed to the separation of the Protagrionidae from the Meganeuridae and Paralogidae, but he insisted that the name Protodonata must be associated with *Protagrion*, and contended that I was in error in placing the Meganeuridae in the Order Protodonata. His reason for these assertions was that "Brongniart established his family Protagriidae [Protagrionidae] on a single genus *Protagrion* (1885); the family was therefore a monotypic one and by the International Rules of Nomenclature it matters not whether the family afterwards assumed ordinal rank or that further genera or families were added to it, it must take the characters from *Protagrion*, that is, from the original type."

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[4] Throughout this article I am using the name Protagrionidae, instead of Protagriidae, for the family based upon the genus *Protagrion*. This is in accordance with the information provided by Professor Joshua Whatmough of Harvard University and published in B. E. Montgomery's article on this subject (Annals Ent. Soc. Amer., 47: 473-474, 1954).

It is clear from this quoted passage that Fraser's conclusions are based on his belief that *Protagrion* was designated by Brongniart as the type genus of the Order Protodonata and that the Rules of Nomenclature consequently require us to use that conception of the order. I believe it is Dr. Fraser who is in error here. The Rules of Nomenclature have not been applied by the Commission on Nomenclature to orders and higher taxa. The accepted policy regarding these higher categories has been well summarized by Simpson in his recent discussion of the principles of taxonomy (1961, p. 30): "Proposals have been made to extend the type system (and priority) to names of still higher taxa, above superfamilies, but this provision is not now embodied in the Rules or in general usage. At present the names of those higher taxa, of course much less numerous than names of genera or species, are determined only by consensus and acceptance of authority, and at these levels that informal system seems to work at least as well as the Rules do at lower levels."

Since the term Protodonata was first used in an ordinal capacity by Handlirsch (1906b), as I have stated above, and since his definition of the order was based mainly on the Meganeuridae, I prefer to use the name Protodonata for the order containing the Meganeuridae.

Moreover, if the Rules of Nomenclature are applied to the ordinal name here, I contend that *Protagrion* has no standing as the type genus of the Protodonata and that, in fact, the genus *Meganeura* more logically and appropriately stands as the type genus. In this connection it is necessary to correct Fraser's statement quoted above, that "Brongniart established his family Protagriidae on a single genus *Protagrion* (1885)". At no time did Brongniart ever use the family name Protagriidae [Protagrionidae]; it was first used by Handlirsch in 1906 (1906b). Consequently, this statement by Fraser has no meaning or application whatsoever to the term Protodonata. The name Protodonata was first used by Brongniart in 1885 (p. 55). In this paper Brongniart discussed a series of orders, one of these being the "Neurorthopteres" and another the "Pseudoneuroptera". In this latter order he placed, among others, two families, one which he called Megasecopterida and another which he designated Protodonata. His precise statement about the "family Protodonata" is as follows: "Je rangerai à côté de ces Megasecopterida un type ancestral des Libellules; la création de la famille des Protodonata . . . et du genre *Protagrion* . . . me semble nécessaire. Une aile seulement a été trouvée jusqu'ici à Commentry; elles [sic] mesure 10 centimètres de long et 2 centimètres de large. Sa forme, sa nervation et sa réticulation rappellent beaucoup celle des Odonates actuels. Il y a cependant d'assez notables différences."

Since this was the first mention of the genus *Protagrion* in the literature anywhere and since there was no mention of any species in the genus, the name *Protagrion* was a *nomen nudum*. This use of the term Protodonata did not, therefore, establish a precedent or policy with respect to use of the name. The next.use of the term Protodonata, again for a family, was by Brongniart in 1894 (p. 394). At the beginning of Chapter V, entitled "Protodonata", there was a discussion of the characteristics of the Protodonata based almost entirely on *Meganeura*; the genus *Protagrion* was not even mentioned there. In the descriptive part of the work, the first genus considered was *Meganeura*, which was fully described, along with two species in the genus, *monyi* and *selysii*. The other genera also assigned in the "family Protodonata" in chronological order were: *Paralogus, Titanophasma*, *Protagrion*, *Campyloptera*, and *Brodia*. *Protagrion* was, therefore, fourth in the series of genera placed in the "family Protodonata". From this I think it is clear that there is no basis for Dr. Fraser's statement that the Order Protodonata "must take the characters of *Protagrion*".

Since the first definition of the Protodonata as an order (Handlirsch, 1906b) was based mainly on the Meganeuridae, and since Brongniart's first valid use (1894) of the term Protodonata for a "family" was based almost exclusively on *Meganeura*, I do not accept the removal of the Meganeuridae from the Protodonata and the erection of another order (Meganisoptera) for that family. In my opinion the Order Meganisoptera is identical with the Order Protodonata.

Whether the Protodonata should be considered a separate order or a suborder of the Odonata is largely a matter of personal choice. Fraser (1957, p. 24) considers the group (Meganisoptera) to be a suborder, whereas Martynov (1932b, p. 43; 1938, p. 62) treated it as a distinct order. I strongly support its ordinal rank; the absence of a nodus, a pterostigma and a true arculus places these insects outside the phylogenetic complex of the Odonata.

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AUSTRALIAN CARABID BEETLES IV. LIST OF LOCALITIES, 1956-1958[1]

By P. J. Darlington, Jr.

Museum of Comparative Zoology, Cambridge, Mass.

This is a brief account, with list of localities, of a collecting trip that I made to Australia from December 1956 to June 1958. My wife and fourteen year old son accompanied me. My own travel expenses were paid in part by a fellowship of the John Simon Guggenheim Memorial Foundation. My purpose was to collect carabid beetles in the wetter forests of the whole eastern edge of Australia, from southern Tasmania to northern Cape York. The present paper summarizes our itinerary and then lists the localities at which Carabidae were obtained. I had collected at some of these localities previously, in 1931-1932, as a member of the Harvard Australian Expedition.

We reached Sydney December 2, 1956, and proceeded to Tasmania December 7. We bought a used (and abused) Volkswagen pickup truck in Hobart and traveled and lived in it most of the time thereafter.

We stayed in Tasmania until April 5, 1957. Collecting was done mostly in the wetter forests there; first into the accessible edges of the almost impenetrable southwestern forest (Arve River, Hartz Mountain, Mt. Field, Florentine River, Zeehan, etc., and later Corinna); then in mountainous north-central Tasmania (Lake St. Clair, Waldheim and Cradle Mt., Great Lake, Waratah, etc); and finally on isolated mountains and plateaus in the northeast (Mt. Ben Lomond, Blue Tier, Mt. Barrow, etc.). Although the most extensive wet forests are in the south and west, we found some of the finest stands of *Nothofagus* (southern beech) on and near the Blue Tier in northeastern Tasmania. Lake St. Clair was the best (most diverse and richest) Tasmanian locality visited. The most southern locality reached was Cockle Creek, about 5 miles from the southernmost tip of land.

On the mainland of Australia, beginning in April, 1957, we worked the Otway Ranges southwest of Melbourne, then crossed the mountains via Mt. Hotham and Omeo to Canberra, which we reached May 1, and where we made winter quarters in a rented house.

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[1] Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

At Canberra I studied the types of Australian Carabidae in the Sloane Collection, now in care of the Commonwealth Scientific and Industrial Research Organization. During this time we collected repeatedly on the Brindabella Range west of Canberra, briefly on the lower slopes of Mt. Kosciusco, and at other places within reach.

From Canberra, starting September 1, 1957, we crossed by the Sturt Highway to Adelaide, where I examined Sloane's and Lea's Tasmanian carabid types. We then followed the coast south, east, and north, via Melbourne, to Sydney, making side trips to collect on Mt. Baw Baw, Wilsons Promontory, etc.

From Sydney, October 15, 1957, we started a long zig-zag through northern New South Wales, going west almost to Nyngan, back to the Mt. Royal Range (incl. Barrington Tops), and north via the Comboyne, the Dorrigo-Ebor plateau (including New England National Park and Point Lookout, a magnificent, mile-high collecting place), Armidale, and a series of localities across extreme northern New South Wales, to Brisbane in Queensland.

We reached Brisbane November 12, 1957, and left on the 16th for North Queensland. Going north, we worked (among other places) the Eungella Range (an important, isolated rain forest locality inland from Mackay), and Mt. Spec, Mt. Fox, and the Kirrama Range. We reached Cairns December 6.

From Cairns, we began work on the Atherton Tableland, in the largest and richest tropical rain forest area in Australia. We found the ground at Kuranda too dry, so moved our headquarters to Atherton and collected thereabouts, especially on the Dividing Range south and west of the town. December 13-16, 1957, we camped and collected on Mt. Bartle Frere. December 20, we returned to Cairns, and in the next few days did Thornton Peak (Mt. Alexandra) northeast of Daintree and Mt. Lewis southwest of Mossman. From December 31, 1957 to January 3, 1958, I collected alone on Mt. Bellenden Ker.

On January 7, 1958, we flew to Thursday Island and crossed to the tip-of-peninsular forests of Cape York, collecting at Bamaga and Lockerbie until the 20th. From Lockerbie we worked to within 10 miles of the northern tip of continental Australia. My son and I interrupted the return flight at Iron Range for a week's collecting, including a side trip on foot to Tozer Gap.

We spent most of February, 1958, on the Atherton Tableland, where, however, collecting was hampered by continual heavy rain.

From late February until March 13 we were moving south, re-visiting the Kirrama Range and Mt. Spec, and reaching two additional, important localities: the isolated rain forest on the Elliot Range southeast of Townsville, and Mt. Jacob near Many Peaks, where is the northernmost rain forest (or semi-rain forest) of the South Queensland forest system.

From Brisbane, March 19 to April 12, 1958, we made a loop south to Victoria, to collect on high mountains that had been snow covered before. We reached highest altitudes on Mt. Kosciusco, then drove south on the Bonang Highway into Victoria (this road cuts some fine and apparently unworked collecting areas), then collected on the summit ridge of Mt. Baw Baw, on Mt. Buller briefly, on Mt. Hotham again, and at Pretty Valley on Mt. Bogong. Returning north we touched Exeter and Ourimbah (type localities) in south-central New South Wales, Bellangry Forest northwest of Wauchope, Point Lookout again, and localities in the extreme north of New South Wales.

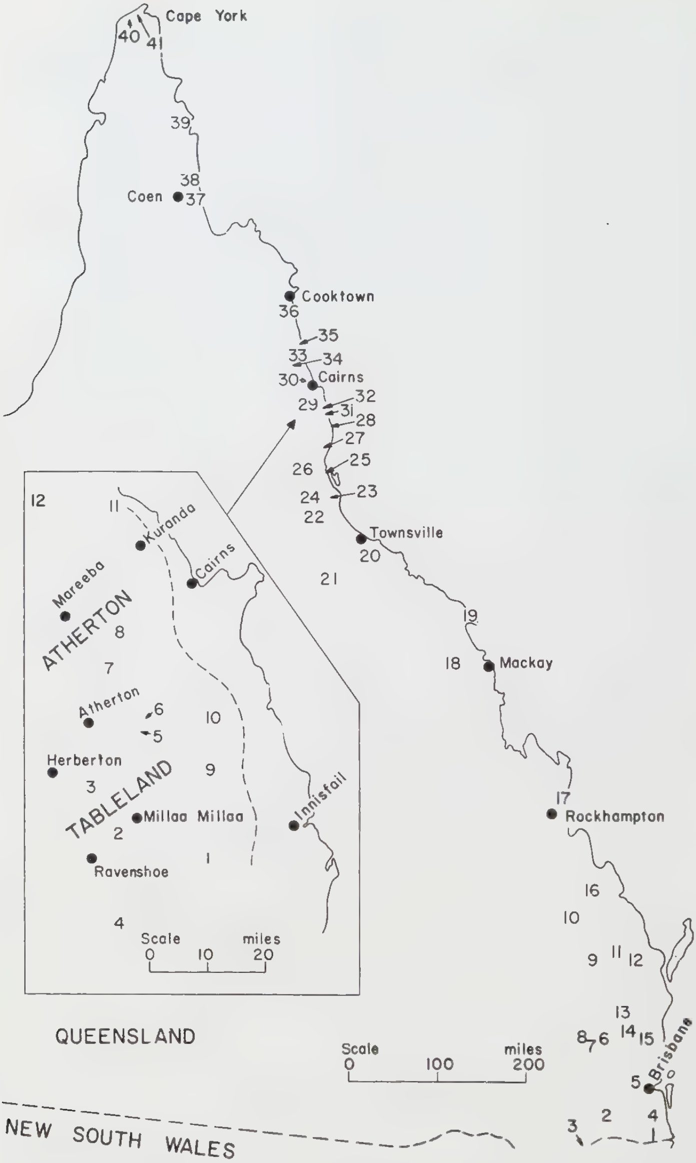
On April 19, 1958, we started another loop, through South Queensland, working rain forest areas, the most important being on the Bunya and Blackall Ranges. Then, beginning May 6, we spent a week at Binna Burra on the McPherson Range on the Queensland-New South Wales border.

Beginning May 23, 1958, we flew back to Cairns, collected along the Black Mt. road north of Kuranda, flew halfway up the Cape York Peninsula to Coen, and from there were taken by Lea Wassell to Silver Plains and the Rocky Scrub (rain forest) on the east side of the peninsula. Returning from this trip, we stopped for nearly a week at Shiptons Flat and Mt. Finnigan, about 25 miles south of Cooktown.

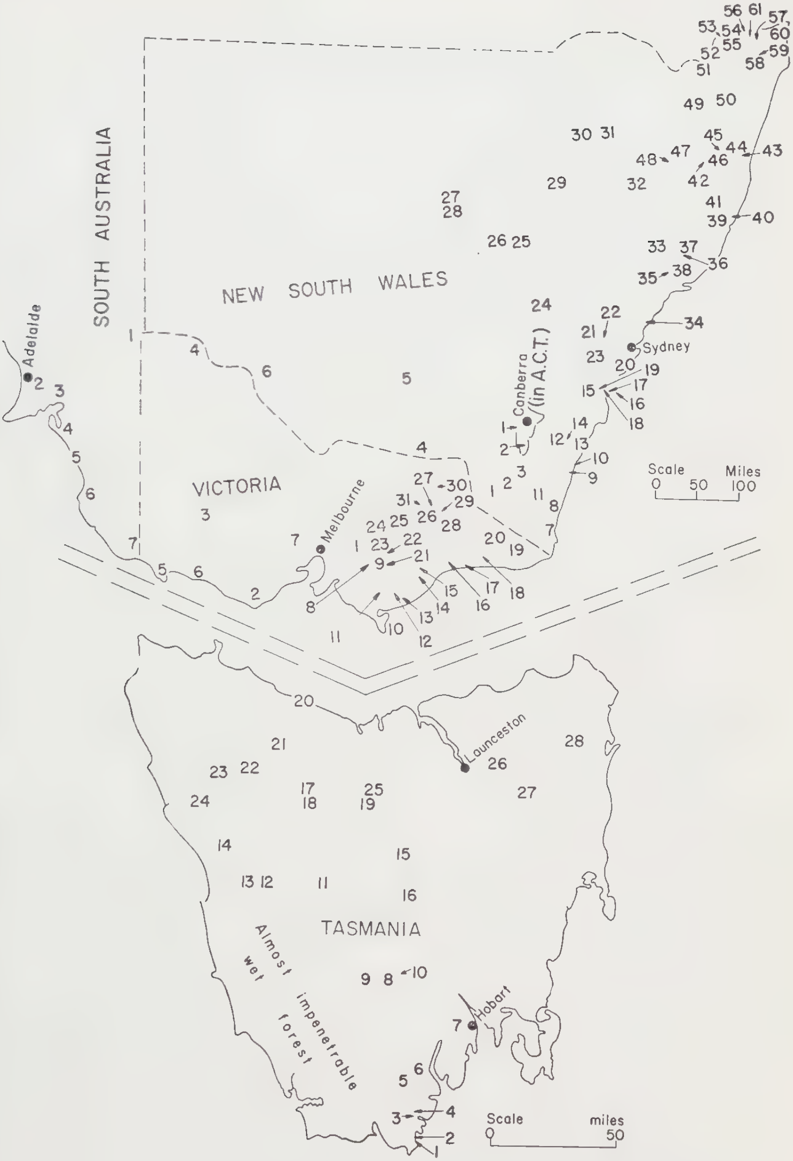
We were back in Sydney June 17, 1958, and from there circled through the southern Blue Mts. (Springwood), the Burragorang Valley, Burrawang, etc.

We started the flight home from Sydney June 25, reaching Boston the afternoon of June 29, 1958.

All specimens collected reached Boston safely, and have been mounted and labeled and are ready for study. We got little except Carabidae and a useful series of ants collected by my son. We had neither time nor strength for general collecting.



MAP OF QUEENSLAND WITH INSET OF ATHERTON TABLELAND



Maps of New South Wales, Victoria, and Eastern South Australia and of Tasmania.

LIST OF LOCALITIES

Localities are listed approximately from north to south, because faunal transitions are best treated in that direction, although our collecting (and the numbering of our maps) was in general in the other direction. Letters and numbers following the names refer to the accompanying maps (Q=Queensland map, etc), on which the approximate position of localities is shown by number. One number is sometimes used to include two or more adjacent localities. Names are spelled according to Gazetteer No. 40, AUSTRALIA, prepared by the United States Office of Geography, Dept. of Interior (1957), with my original spelling indicated in parentheses if different. Latitudes and longitudes of most localities can be obtained from this gazetteer. Topography of each locality is indicated by "low" (lowlands, incl. interior plains with lowland topography even if at moderate altitudes), "plat" (plateaus rising from lowlands), "mts" (mountains), and "rge" (mountain range). Altitudes given are usually the approximate or prob(able) altitudes at which collecting was done rather than exact altitudes of fixed points. Types of forests chiefly collected in are indicated as savannah w(oodland), sclerophyll f(orest), and rain f(orest). This is the primary classification of forests in the wetter parts of eastern Australia (see "The Australian Environment," Commonwealth Scientific and Industrial Research Organization, Melbourne, second ed., 1950, p. 78). Savannah woodland has trees (usually eucalypts) widely spaced, and ground covered with grass or herbs. Sclerophyll forest has trees closer, and dense undergrowth of shrubs. Rain forest has trees close, often many vines, but scanty undergrowth. Of course there is variation and transition within this main classification. Savannah woodland varies in height and spacing of trees and (in Tasmania and southern Australia) sometimes merges with sclerophyll forest. Sclerophyll forest may be dry or wet, and wet sclerophyll is sometimes difficult to distinguish from poor rain forest. Tropical rain forest (often with giant fig trees etc.) and south temperate rain forest (often with antarctic beeches of the genus *Nothofagus*) are very different botanically, and entomologically. And tropical rain forest varies considerably and (as here used) sometimes grades into seasonally dry monsoon forest. My classification of forests in the following list is somewhat arbitrary and is based on general impressions rather than exact data. Dates are those of my collecting. Previous collecting done at the same localities in 1931-1932 is indicated in parentheses. Single words or phrases are used to indicate *principal* collecting methods used at each locality. "Logs" means under logs on the ground, or in rotting logs. "Stones" means under stones. "Waterside" means beside, or in vegetation in, standing or running water. "Drowning" means throwing large quantities of loose soil, leaf litter, or debris into water and catching the Carabidae that come to the surface of the wet materials. This is a little known but very effective collecting method. "Bark" means collecting under loose slabs and flakes of bark on trunks of living trees, usually eucalyptus. A whole special insect fauna lives in this habitat in Australia. "Arboreal" means beating and sweeping. And "light" means collecting insects attracted to artificial light at night. "Usual ground m(ethods)" means first four methods listed above. "All usual m(ethods)" means all methods listed except light, which is separately specified.

LOCKERBIE, Q41; low; light rain f, savannah w; Jan. 11-15, 58; all usual m, light.

BAMAGA, Q40; low; savannah w, light rain f; Jan. 7-11. 15-20, 58; all usual m, light.

IRON RANGE, Q39; low; rain f, savannah w; Jan. 21-28, 58; all usual m.

TOZER GAP, Q39; mts to over 1000 ft.; rain f, savannah w; Jan. 25-26, 58; logs, stones.

COEN, named on Q map; low; savannah w, gallery f; May 27, June 4-5, 58 (also 1932); all usual m.

ROCKY RIVER (Rocky Scrub), Q38; low to mts *c.* 2000 ft.; rain f., savannah w; May 30-June 2, 58 (also west side this "scrub" in 1932); all usual m incl. much drowning of ground debris from upper banks of river in rain f.

SILVER PLAINS, Q37; low; savannah w; May 27-June 4, 58; logs, waterside, light.

COOKTOWN, named on Q map; low; poor rain f, savannah w (much cleared); June 5, 10-12, 58; little collecting.

SHIPTONS FLAT, Q36; *c.* 1000 ft.; good savannah w to gallery rain f, with transitions; June 5-10, 58; all usual m.

MT. FINNIGAN, Q36; 1000 to over 3000 ft.; rain f, savannah w, transitions; June 5-10, 58; all usual m (collected up to and in edge elfin f, but catch inexplicably poor).

THORNTON('S) PEAK (or Mt. Alexandra), Q35; *c.* 1000 to *c.* 4500 ft.; rain f, elfin f near summit; Dec. 21-22, 57; stones, logs (collecting cut short by bad weather).

MOSSMAN-DAINTREE AREA, Q33; low; diverse vegetation (much altered); Dec. 20-27, 57; little collecting except on Thornton Peak (see above) and Mt. Lewis (see below).

MT. LEWIS, Q34; to *c.* 4000 ft.; rain f; Dec. 25-27, 57; stones, logs.

CAIRNS, named on Q map; low; diverse vegetation (much altered) incl. remnants rain f; various dates Dec. 57-Feb. 58, May-June 58; all usual m, light.

KURANDA, Q30, and named on Atherton Tab map; on plat *c.* 1000 ft.; rain f, some savannah w; various dates Dec. 57 to May 58; all usual m.

Atherton Tableland, Q29, and inset on Q map; plat *c.* 2000-3000 ft., with mts to 4000 (attached Mts. Bartle Frere, Bellenden Ker over 5000); many tracts rain f, good savannah w; several visits, Dec. 57 to May 58 (also 1932); intensive collecting at various points, all usual m.

Mt. Molloy (town), Atherton Tab map 12 (but town not on the tableland); low; dry savannah w; Dec. 27, 57; little collecting.

Mareeba, named on Atherton Tab map; low; savannah w; several brief visits, but collected especially some miles north, Feb. 58; collecting especially on margins shallow, flooded ponds (flood collecting).

Davies Creek road, Atherton Tab 8; mts to *c.* 3000 ft.; good savannah w to good rain f; Dec. 27-29, 57, May 25, 58; logs, stones.

Mountains north of Kairi, Atherton Tab 7; to 4000 ft.; rain f; Dec. 19 ,57; logs, stones.

Atherton (named on Atherton Tab map); on plat prob. *c.* 3000 ft. (mountains south and west to 4000 ft.), good savannah w, patches rain f on flat tableland near town, much rain f on mts.; Dec. 10-20, 57, Feb. 3-11, 58; all usual m.

Lake Barrine, Atherton Tab 6; on plat prob. *c.* 2000 ft.; rain f; no collecting this trip (much in 1932).

Lake Eacham, Atherton Tab 5; on plat prob. *c.* 2000 ft.; rain f; Feb. 58; stones, waterside.

Herberton, named on Atherton Tab map; prob. *c.* 2000 ft.; savannah w (prob. some rain f to east, not visited by us); Feb. 58; collecting chiefly in piles of dead leaves under small fallen eucalypts.

Longlands Gap, Atherton Tab 3; mts prob. *c.* 3000 ft.; rain f; Dec. 18, 57, Feb. 11, 58; all usual m.

The Crater, Atherton Tab 3; prob. over 2000 ft.; rain f; Dec. 18, 57; logs, stones.

Mt. Bellenden Ker, Q32, Atherton Tab 10; to *c.* 5000 ft.; mostly rain f; Dec. 31, 57-Jan. 3, 58; stones, logs.

Mt. Bartle Frere, Q31, Atherton Tab 9; to *c.* 5000 ft.; mostly rain f; Dec. 13-16, 57; stones, logs.

Millaa Millaa, named on Atherton Tab map; on plat prob. *c.* 2500 ft.; rain f; Dec. 18, 57 (also 1932); stones, logs.

Mt. Fisher, Atherton Tab 2; to *c.* 4000 ft.; rain f; Feb. 12, 58; stones, logs.

Ravenshoe, named on Atherton Tab map; on plat prob. *c.* 3000 ft.; good savannah w, rain f south and east; Feb. 11-13, 20-21, 58; logs, stones, and special collecting by edges of rain pools west of town, washing leaf debris from under thickets etc., and treading heavy aquatic vegetation over deep water in pool of river visible from road 2 or 3 miles west of town.

Crawfords Lookout, Atherton Tab 1; prob. *c.* 1000 ft.; rain f, savannah w; Feb. 21-22, 58; little collecting.

Innisfail, Q28, and named on Atherton Tab map; low; mixed vegetation (much altered); Feb. 22, 58; no collecting in town, but some in rain f, along Millaa Millaa-Innisfail road; logs, stones.

Tully Falls, Atherton Tab 4; prob. 2000-3000 ft. (above falls); some rain f; Feb. 58; little collecting.

Tully, Q27; low; various vegetations; passed Dec. 57, Feb. 58; little collecting.

Cardwell, Q25; low; various vegetations; passed Dec. 57, Feb. 58; little collecting.

Kirrama Range, Q26, to *c.* 3000 ft., rain f, savannah w; Dec. 4-6, 57, Feb. 22-23, 58; usual ground m.

INGHAM, Q23; low; mixed vegetation; passed Dec. 57, Feb. 58; little collecting.

MT. FOX PLATEAU, Q24; *c.* 2000 ft.; savannah w, some rain f; Dec. 3, 57; poor collecting.

MT. SPEC PLATEAU (incl. Paluma Range), Q22; to *c.* 3000 ft.; rain f, savannah w to west; Nov. 30-Dec. 2, 57, Feb. 23-27, 58; stones, logs.

TOWNSVILLE, named on Q map; low; dry savannah w (much altered by man); Nov. 29-30, 57, Feb. 27-Mar. 1, 58; little collecting near town, except some at lights in outskirts.

ELLIOT RANGE, Q20; to over 3000 ft.; savannah w on slopes, rain f on high ridge; Mar. 2, 58; logs, stones in rain f on "Sharp Elliot".

CHARTERS TOWERS, Q21; low; dry savannah w; Mar. 3, 58; a little river-bank collecting where Townsville road crosses Burdekin R.

PROSERPINE, Q19; under 1000 ft.; mixed vegetation (much altered by man) incl. palm f toward Repulse Bay; Nov. 28, 57; very poor collecting (too dry), in palm f.

MACKAY, named on Q map; low; mixed vegetation (altered by man); Nov. 21-22, 27-28, 57, Mar. 5-6, 58; little collecting near town, but some along road toward Rockhampton.

EUNGELLA RANGE, Q18; to *c.* 4000 ft.; rain f, good savannah w to west; Nov. 22-27, 57; all usual m.

BYFIELD, Q17; low; mixed vegetation (largely altered by man) incl. remnants approaching rain f; Nov. 18-19, 57; logs, stones, drowning along small brook in palm f.

ROCKHAMPTON, named on Q map; low; dry savannah w, swamps, dense dry sclerophyll *c.* 50 miles west; passed Nov. 17-20, 57, Mar. 58; little collecting near the town, mostly around swamps, but some at stated distances in various directions.

MANY PEAKS, Q16; low; savannah w; Mar. 11, 58; no collecting at town but some along road north.

MT. JACOB, Q16; rge *c.* 2000 ft.; rain f (or something like it), savannah w; Mar. 11-12, 58; logs, stones.

MONTO, Q10; low; savannah w, tract of dense dry sclerophyll f; Apr. 23-25, 57; logs, stones esp. in sclerophyll f.

GAYNDAH, Q9; low; savannah w, formerly rain f but latter cleared; Apr. 22-25, 57; little collecting, mostly bark, river margins.

BIGGENDEN, Q11; low, hills; savannah w, something like rain f to southwest; Apr. 30, 58; little collecting, in rain f.

GOODNIGHT FOREST, Q12; low; thick dry sclerophyll; May 1, 58; poor collecting, but a few small carabs by water holes.

GALLANGOWAN FOREST, *v.* Manumbar, Q13; rge *c.* 2000 ft.; rain f, good savannah w or open sclerophyll f; Apr. 26-27, 58; logs, stones.

JIMNA, Q14; moderate altitude; mixed vegetation; Apr. 27, 58; little collecting.

BLACKALL RANGE, incl. Mapleton, Montville, Maleny, Q15; to *c.* 2000 ft.; rain f, good savannah w or open sclerophyll f; Apr. 27-28, May 3-5, 58; logs, stones, mostly in rain f.

KENILWORTH, Q15; low; mixed vegetation incl. rain f; May 2, 58; logs, stones.

BUNYA MTS., Q8; to over 3000 ft.; rain f, good savannah w or open sclerophyll f; Apr. 20-21, 58; stones, logs.

COOYAR CREEK, Q7; low; savannah w; Apr. 19-20, 58; logs.

BENARKIN, Q6; low; woods approximating rain f; Apr. 19, 58; little collecting.

Yarraman, Q6; low; savannah w, woods approximating rain f; Apr. 19, 58; logs.

Brisbane, named on Q map; low; savannah w; various visits Nov. 57 to June 58 (also 1932, 1943); little collecting near city (specimens from nearest rain f, on Mt. Glorious & Mt. Tamborine, labelled from these places).

Mt. Glorious, Q5; prob. *c.* 1000 ft.; rain f, good savannah w; mid-May 58; little collecting (more in Nov. 43), stones, logs, mostly in rain f.

Mt. Tamborine, Q4; plat *c.* 2000 ft.; rain f; not visited 1957-58 but collected Nov. 1943; logs, stones, drowning debris in rain f.

Cunninghams Gap, Q2; mts *c.* 2000-4000 ft.; rain f; May 13-14, 58; logs, stones (most specimens taken in gap proper, but we collected from there nearly to summit Mt. Cordeaux, *c.* 4000 ft.).

McPherson Range (Q. Nat. Park), Q1; to *c.* 4000 ft.; mountain rain f, some savannah w, small areas almost pure *Nothofagus* f on highest points; May 58 (see Binna Burra, below) (collected on McPherson Range also 1932).

Binna Burra (Binnaburra), Q1; on rge *c.* 3000 ft. and over; mountain rain f, some savannah w; May 6-10, 58; usual ground m.

Beechmont, Q1; on rge *c.* 3000 ft.; rain f., savannah w; passed repeatedly 1957-1958 but collected only 1943, in rain f probably now cleared.

Springbrook, Q1; on rge *c.* 2000 ft.; mixed vegetations incl. rain f; May 10-11, 58; little collecting, logs, stones.

Stanthrope, Q3; to prob. *c.* 5000 ft.; savannah w etc. (no rain f); passed repeatedly 1958; no personal collecting, but obtained specimens from Mr. E. Sutton.

Wyberba, Q3; to over 5000 ft.; savannah w and/or good sclerophyll f, rocky and bushy country; May 16, 58; poor collecting (dry year) but good locality, specimens obtained from Mr. Sutton.

Woodenbong, NSW56; moderate alt.; good savannah w; May 17, 58, and other dates; poor collecting (dry year), logs.

Unumgar Forest (Cox's Road), NSW61; mts *c.* 2000 ft.; mostly rain f; May 17-18, 58; logs, stones.

Wiangaree, NSW57; low; savannah w; Nov. 9, 57; waterside.

Murwillumbah, NSW60; low to *c.* 1000 ft.; mixed vegetation incl. rain f *c.* 10 miles westsouthwest (at Byrrill Ck.); Nov. 10-11, 57; stones, logs, in rain f.

Dunoon, NSW59; moderate altitude; mixed vegetation including rain f at rather low altitude (also rain f at prob. *c.* 2000 ft. up forestry road to Whian Whian Forest); Nov. 10, 57, Apr. 12, 58; logs, stones in rain f.

Lismore, NSW58; low; mixed vegetation incl. small piece rain f preserved in town, larger piece *c.* 4 miles northeast; several dates especially Apr. 11, 58; logs, stones, mostly in rain forest 4 miles northeast.

Acacia Plateau, NSW54; *c.* 2000 ft.; rain f; Nov. 7-8, 57; logs, stones.

Acacia Creek, NSW53; low; mixed vegetation, now no real rain f; Nov. 7, 57; little collecting.

Tooloom Range, NSW55; to *c.* 2000 ft.; rain f south slope, also savannah w; Nov. 8-9, 57, May 16-17, 58; usual ground m incl. drowning debris from beside small temporary pond in opening in rain f.

Wilsons Downfall, NSW52; moderate altitude; savannah w; Nov. 7, 57; little collecting.

Tenterfield, NSW51; moderate to rather high altitude; savannah w; Nov. 7, 57; collecting at stated distances in various directions, logs, stones.

Glen Innes, NSW49; various altitudes; savannah w; Nov. 5, 7, 57, and other times briefly; collecting at stated distances in various directions, logs, stones.

c. 40 miles eastnortheast (ENE) Glen Innes, NSW50; moderate altitude; savannah w, heathy f, patches rain f; Nov. 6, 57; usual ground m.

Armidale, NSW47; moderate altitude; savannah w; Nov. 2-5, 57, and other brief visits; little collecting.

Uralla, NSW48; moderate altitude; savannah w; Nov. 3, 57; logs.

Ebor, NSW45; to *c.* 5000 ft.; savannah w; Oct. 31-Nov. 1, 57, Apr. 9, 58; logs, stones.

New England National Park (Point Lookout), NSW46; to over 5000 ft.; rain f incl. *Nothofagus*, some savannah w; Nov. 1-2, 57, Apr. 9, 58; usual ground m.

Dorrigo, NSW44; plat *c.* 2000-3000 ft. (and same plateau west rises to *c.* 5000 ft. at Ebor etc.); rain f, savannah w; Oct. 31, 57 (also 1932); stones, logs.

Bellingen, NSW43; low; mixed vegetation incl. remnants of something like rain f; Oct. 30-31, 57; logs, stones.

The Big Hill (Kempsey-Ebor road), NSW42; up to Ebor plat; semi-rain f; Apr. 8, 58; logs, stones.

Bellangry Forest (northwest of Wauchope), NSW41; mts to prob. *c.* 3000 ft.; rain f, said to include *Nothofagus*; Apr. 6-7, 58; logs, stones.

The Comboyne, NSW39; plat to *c.* 2800 ft.; mixed f incl. remnants rain f in gullies; Oct. 28-29, 57; logs, stones, especially near Mt. Gibralter and in gully northeast.

Port Macquarie, NSW40; low; mixed f incl. small tract something like rain f; Oct. 29-30, 57; logs.

Mt. Royal Range, NSW33; plat to *c.* 5000 ft.; savannah w on slopes, savannah w and rain f incl. *Nothofagus* on plat; Oct. 23-27, 57; usual ground m (see 3 following localities).

Barrington House, NSW33; low at southeast foot Mt. Royal Range; gallery rain f along river; Oct. 25-26, 57; usual ground m.

Barrington Tops, NSW33; plat on southeast end Mt. Royal Range, which see (above); Oct. 27, 57 (also 1932); usual ground m.

Tomalla Tops, NSW33; plat on northwest end Mt. Royal Range, which see (above); Oct. 23-25, 57; usual ground m.

Gloucester, NSW37; low; savannah w; Oct. 28, 57; logs.

Paterson, NSW35; low; savannah w; Oct. 25, 57; logs.

Stratford, NSW36; low; savannah w; Oct. 28, 57; logs.

Booral (10 miles east of), NSW38; low; savannah w, thicker in stream gully; Apr. 6, 58; logs.

Ourimbah, NSW34; low; savannah w, formerly semi-rain f (we did not find latter); Apr. 5, 58; poor collecting.

Tamworth, NSW32; low; savannah w; Oct. 22, 57; chiefly waterside.

Mt. Kaputar, NSW31; to *c.* 4000 ft.; savannah w with underbrush in places; Oct. 20, 57; logs, stones, chiefly near summit.

Narrabri, NSW30; low; savannah w and/or rather dry sclerophyll f; Oct. 19, 57; little collecting.

Coonabarabran (north of), NSW29; low; savannah w and/or dry sclerophyll f; Oct. 19, 57; logs, stones.

Nyngan, NSW27; low; originally dry savannah w or sclerophyll f, now mostly cleared for sheep; in vicinity Oct. 17-19, 57; poor collecting (dry year) at stated distances south and east.

BOGAN RIVER, NSW28; low; originally dry savannah w or sclerophyll f, now mostly cleared for sheep; Oct. 18-19, 57; poor collecting (dry year) except by edges pools in bed of Bogan R., but specimens obtained from Mr. J. W. T. Armstrong.

NARROMINE, NSW26; low; savannah w and/or rather dry sclerophyll f; Oct. 17, 57; little collecting.

DUBBO, NSW25; low; savannah w or rather dry sclerophyll f; Oct. 17, 57; little collecting.

ORANGE, NSW24; low; originally savannah w or rather dry sclerophyll f; Oct. 16, 57; little collecting.

MT. CANOBOLAS, NSW24; to *c.* 4500 ft.; savannah w; Oct. 16-17, 57; stones, logs near summit and especially near camp site at base (specimens taken at base are so labeled).

BLUE MTS., NSW21; mts to over 3000 ft.; various vegetations incl. bushy heath, sclerophyll f, savannah w, wetter f in ravines; collected only at Springwood (see below) in 1957-58 (but at several localities in 1932).

SPRINGWOOD, NSW22, prob. *c.* 1000 ft.; savannah w, wetter f in ravine to south; June 58; logs, stones, especially in wet ravine.

BURRAGORANG VALLEY, NSW23; low; savannah w; June 58; logs.

SYDNEY, named on NSW map; low; originally savannah w, dry sclerophyll, etc., but now much altered by man; in vicinity various dates 1956-1958 (also 1931-1932, 1943); little collecting near city.

NATIONAL PARK, NSW20; low; sclerophyll f etc.; Oct. 9-10, 57 (also 1931); little collecting.

EXETER, NSW15; low; savannah w; Apr. 4, 58; logs.

BURRAWANG, NSW19; low; savannah w; June 58; logs, stones.

MACQUARIE PASS, NSW18; edge plat; savannah w and thickets; June 58; drowning ground debris.

JAMBEROO, NSW17; low; savannah w and wetter thicker f in ravine; June 58; stones, logs in wetter f.

KIAMA, NSW16; low but Saddleback Mt. to prob. *c.* 2000 ft.; savannah w much cleared, but remnants of good woods still on Saddleback; Oct. 8-9, 57; logs, stones in f on Saddleback.

SADDLEBACK MT., see Kiama, above.

TERMEIL (Batemans Bay), NSW13; low, but worked into hills northwest nearly to Pigeon House; savannah w; Oct. 5-7, 57; logs, stones, and by pools intermittent brook in hills toward Pigeon House.

BATEMANS BAY, see Termeil (above).

PIGEON HOUSE, see Termeil (above).

CLYDE MT., NSW14; prob. *c.* 2000 ft. (edge plat); good mixed forest with considerable underbrush; several visits from Canberra May-Aug. 57; logs, stones.

BRAIDWOOD, NSW12; low (but on plat); savannah w (mostly cleared); July 11, 57; flood collecting along river and streams.

MORUYA, NSW10; low; savannah w (mostly cleared); July 11, 57; flood collecting.

BODALLA, NSW9; low; savannah w (mostly cleared); July 11, 57; collecting esp. by standing flood water in woods.

BROWN MT., NSW11; prob. *c.* 2000 ft. (edge plat); good woods with considerable underbrush; Oct. 4, 57; logs, stones.

BEGA, NSW8; low; savannah w (partly cleared); Oct. 4, 57; logs, stones.

EDEN, NSW7; low; savannah w (much cleared); Oct. 4, 57; collecting at stated distances north and west, logs, stones.

COOMA, NSW3; on plat; savannah w; passed several times; little collecting.

ADAMINARY DAM, NSW2; on plat; savannah w; Aug. 3, 57; attempted flood collecting as dam filled, but unsuccessful.

MT. KOSCIUSCO, NSW1; to over 7000 ft. (highest mt in Australia); good sclerophyll f on slopes, open snow gum w higher, mountain moors still higher; Aug. 3, 57, Mar. 22-23, 58 (also 1931); usual ground m, bark.

ALBURY, NSW4; low; savannah w etc. (mostly cleared); passed on various occasions; little collecting.

BALRANALD, NSW6; low; various dry w; Sept 2-3, 57; little collecting.

NARRANDERA, NSW5; low; various more or less dry w; Sept. 1-2, 57; little collecting, mostly by drowning broken earth

CANBERRA, Australian Capital Territory, named on NSW map; in wide valley on plat; savannah w; May through Aug., 57; usual ground m, bark, but collecting poor (dry year).

BRINDABELLA RANGE (incl. Mt. Franklin and Mt. Gingera), ACT1 on NSW map; to over 6000 ft.; savannah w, sclerophyll f, open snow gum forest (in order with increasing altitude); May, June, 57; usual ground m.

GUDGENBY RIVER, ACT2 on NSW map; in valley on plat; savannah w; June 9, 57; logs, stones, bark.

MITTA MITTA, V30; low; sclerophyll f; Apr. 30-May 1, 57; little collecting.

GLEN WILLS, V29; moderate altitude; sclerophyll f; Apr. 30, 57; bark.

OMEO, V28; low; sclerophyll f; Apr. 25-30, 57; logs, stones, bark, especially along road toward Mt. Hotham.

MT. BOGONG incl. Pretty Valley, V27; plat to *c.* 6000 ft.; sclerophyll f on slopes, open snow gum w and moors higher; Apr. 2, 58; logs, stones.

PRETTY VALLEY, see Mt. Bogong.

MT. HOTHAM, V26; to *c.* 6000 ft.; sclerophyll f on slopes, open snow gum w and moors higher; Apr. 24-28, 57, Mar. 29-31, 58; usual ground m, bark.

BRIGHT, V31; low; sclerophyll f; Apr. 23-24, 57, Mar. 29, Apr. 1, 3 (toward Mt. Buffalo on latter day), 58; logs, stones, bark.

MT. BULLER, V25; to over 5000 ft.; savannah w, sclerophyll f on lower slopes, open snow gum w higher; Mar. 28, 58; logs, stones, drowning debris from under clumps of snow gums.

JAMIESON, V24; moderate altitude; sclerophyll f; Mar. 27, 58; little collecting.

WOODS POINT, V23; moderate altitude; sclerophyll f; Mar. 27, 58; little collecting.

ABERFELDY, V22; moderate altitude; savannah w and/or sclerophyll f; Mar. 27, 58; logs, stones.

WALHALLA, V21; moderate altitude; sclerophyll f and/or savannah w; Mar. 27, 58; little collecting.

MT. BAW BAW, V9; to *c.* 5000 ft.; sclerophyll f on slopes, open snow gum w higher, vestiges rain f incl. *Nothofagus* in gullies *c.* 4000 ft.; Sept. 27-28, 57, Mar. 25-27, 58; logs, stones on wooded slopes (1957), and in high snow gum w (1958), and drowning debris from *Nothofagus* gully (1958) (all *"Trechus"* by last method).

MT. DONNA BUANG, V1; to *c.* 4000 ft.; sclerophyll f, approaching temperate rain f in gullies; several visits Apr. 57 (also 1931); logs, stones, drowning, especially near summit and at Cement Creek.

CEMENT CREEK, see Mt. Donna Buang.

BONANG HIGHWAY, V20; moderate altitudes (from plat south to low); sclerophyll f approaching temperate rain f in gullies; Mar. 24, 58; logs, stones, drowning.

MT. DRUMMER, V19; prob. to *c.* 2000 ft.; savannah w, sclerophyll f; Oct. 3, 58; logs, stones, especially in gully north of road on east slope.

ORBOST, V18; low; savannah w and/or sclerophyll f; Oct. 2-3, 57; little collecting.

LAKES ENTRANCE, V17; low; savannah w and/or sclerophyll f; Oct. 2, 57; little collecting.

BAIRNSDALE, V16; low; savannah w and/or sclerophyll f; Oct. 2, 57; little collecting.

STRATFORD, V15; low; savannah w and/or sclerophyll f; Oct. 2, 57; little collecting.

SALE, V14; low; savannah w; Oct. 1-2, 57; flood collecting.

YARRAM, V13; low; savannah w and/or sclerophyll f; Oct. 1, 57; little collecting.

TARRA VALLEY, V12, on rge prob. *c.* 1000 ft.; sclerophyll f approaching temperate rain f in wet gullies; Sep. 30-Oct. 1, 57; logs, stones.

GUNYAH, V11; on rge prob. *c.* 1000 ft.; sclerophyll f approaching temperate rain f in wet gullies; Sept. 30, 58; logs, stones.

WILSONS PROMONTORY (most southern point of continental Australia), V10; low; sclerophyll f, heath, moors, dunes; Sept. 28-30, 57; poor collecting, tried especially in forest at Lilly Pilly Gully.

NOOJEE, V8; moderate altitude; savannah w to sclerophyll f; Sept. 26, 57, Mar. 25, 58; logs in woods by Neerim-Noojee road.

MELBOURNE, named on V map; low; savannah w (mostly cleared); Apr. & Sept., 57; little collecting near city.

WERRIBEE GORGE, near Bacchus Marsh, V7; low; savannah w; Sept. 19, 21, 57; logs, stones, waterside (beautiful locality, but dry year).

BEECH FOREST, see Otway Ranges.

OTWAY RANGES incl. Beech Forest, V2; plat *c.* 2000 ft.; sclerophyll f approaching rain f in ravines, some *Nothofagus*; Apr. 12-13, Sept. 17-18, 57; logs, stones drowning, especially at Tanybryn Junction and Crowes.

PORT FAIRY, V6; low; various vegetations; Sept. 17, 57; little collecting.

PORTLAND, V5; low; various vegetations; Sept. 17, 57; little collecting.

THE GRAMPIANS, V3; mts prob. to over 2000 ft., dry sclerophyll w, heath; Apr. 14-15, 57; stones, logs (poor collecting, dry year).

MILDURA, V4; low; dry woods etc.; Sept. 3, 57; little collecting.

RENMARK, SA1; low; dry woodland etc., much cleared; Sept. 4, 57; little collecting.

ADELAIDE, named on SA map; low; savannah w (much cleared); Sept. 6-14, 57 (also 1931); little collecting near city.

MT. LOFTY RANGE, SA2; plat to *c.* 2000 ft.; savannah w etc.; Sept. 9, 14, 57; stones, logs.

MURRAY BRIDGE, SA3; low; various vegetations; Sept. 15, 57; collecting mostly along road south toward Meningie.

MENINGIE, SA4; low; various dry vegetations; Sept. 15, 57; collecting mostly along roads north and east.

THE COORONG, SA5; lagoon connected with ocean; various dry vegetations, sand; Sept. 15, 57; little collecting.

KINGSTON, SA6; low; various dry vegetations; Sept. 16, 57; little collecting.

PRINCES HIGHWAY at South Australia-Victoria line; V7; low; good savannah w; Sept. 16, 57; logs, digging (carenums and *Teropha*).

LAUNCESTON, named on T map; low; savannah w etc.; based here Feb. 24-Apr. 5, 57; little collecting near city.

MT. BARROW, T26; to *c.* 4000 ft.; sclerophyll f on slope, *Nothofagus* thickets near tree line, open summit; Apr. 2, 57; stones near summit, drowning debris from *Nothofagus* thickets, logs, stones in f near base.

MT. BEN LOMOND, T27; to *c.* 5000 ft.; savannah w near base, sclerophyll f on slopes (no rain f but ti tree flats and wet gullies in sclerophyll area), moors etc. above *c.* 4000 ft.; Mar. 5-10, 57; usual ground m, bark.

BLUE TIER (plat), T28; plat *c.* 2000 ft.; temperate rain f incl. *Nothofagus* (partly cleared); Mar. 26-Apr. 1, 57; usual ground m incl. much drowning of debris from rain f. Included in collection from this locality are specimens taken in *Nothofagus* f (big trees) beside road between Goshen and Weldborough.

LOTTAH, T28; probably *c.* 1000 ft. (foot of Blue Tier); probably formerly sclerophyll f; Mar. 26, Apr. 1, 57, little collecting. This is an old type locality, but the vegetation has been much altered, and the old collections may have been made many miles from the town of Lottah, perhaps on the Blue Tier.

GOULDS COUNTRY, T28; moderate altitude; wet sclerophyll f; Apr. 1, 57; logs, stones, drowning debris from under thickets.

MOLE CREEK, T25; low; savannah w; Apr. 3, 57; bark, and unsuccessful attempted cave collecting.

MERSEY RIVER, T19; deep river valley; sclerophyll f; Mar. 2-3, 57; poor collecting, mostly washing river banks.

WALDHEIM, *v.* Cradle Mt., T17; mts *c.* 4000 ft.; temperate rain f incl. *Nothofagus*, open snow gum w, moors; Feb. 23-Mar. 1, 57; usual ground m incl. much drowning of debris from rain f and from under clumps of snow gums.

CRADLE MT., T18; *c.* 5000 ft.; moors, bushy heath, rocks, mountain lakes; Feb. 26, 57; stones to *c.* 4500 ft., a little drowning.

BURNIE, T20; low; savannah w; Mar. 13, 23, 57; little collecting.

HIGH LAND SOUTH OF BURNIE, T21; prob. *c.* 1000-2000 ft., wet sclerophyll f, temperate rain f incl. *Nothofagus*; Mar. 20-23, 57; usual ground m.

WARATAH, T22; prob. *c.* 2000 ft.; temperate rain f incl. *Nothofagus*, wet sclerophyll f; Mar. 13-14, 18-20, 57; usual ground m incl. much drowning of debris from rain f. This is a famous old type locality. For practical purposes it includes Magnet (not visited by us), which is nearby.

MAGNET, T22, see Waratah, above.

WHYTE RIVER, T23; low; sclerophyll f, temperate rain f incl. *Nothofagus*; Mar. 17-18, 57; usual ground m.

CORINNA, T24; low; temperate rain f incl. *Nothofagus*; Mar. 14-17, 57; usual ground m.

ZEEHAN, T14; low; wet sclerophyll f, rain f in places (but much cleared); Jan. 17-19, 57; usual ground m, mostly *c.* 8 miles north, and along Rosebery Road.

QUEENSTOWN, T13; low; vegetation stripped; Jan. 17, 19, 57; little collecting except along road toward Lake St. Clair.

(THE) KING RIVER, T12; low; original f stripped, now ti tree thickets etc.; Jan. 17, 19, 57; mostly washing river bars.

LAKE ST. CLAIR, T11; plat and mts *c.* 2400 ft. and over; savannah w (to south), wet sclerophyll f, heavy temperate rain f incl. much *Nothofagus*; Jan. 11-17, 19, 57; usual ground m, and waterside near lake, treading wet moor toward Mt. Rufus.

GREAT LAKE, T15; on plat *c.* 3500 ft.; savannah or snow gum w, open (stripped?) country, moors; Jan. 20 (south end of lake), Mar. 4 (north end), 57; stones, logs at south end, drowning debris from under pencil pines above north end of lake.

OUSE VALLEY, T16; deep valley; savannah w; Jan. 20, 57; logs etc., bark.

Tarraleah, *c.* 20 miles southeast L. St. Clair (T11); moderate altitude; sclerophyll f (also rain f?); Jan. 11, 57; little collecting (but specimens received from Prof. V. V. Hickman).

Ellendale, T10; low; savannah w and/or sclerophyll f; Jan. 11, 57; waterside (by pond in open).

Mt. Field, T8; to *c.* 4000 ft.; wet sclerophyll f, temperate rain f on slopes, open snow gum w, moors above, mountain lakes; Jan. 2-7, 57; usual ground m especially logs, stones toward Mt. Field West, drowning debris from under pencil pines near Lake Dobson, drowning in temperate rain f *c.* half way up road, logs, bark at base.

Florentine Valley, T9; low; wet sclerophyll f with gigantic eucalypts, strips of rain f with *Nothofagus*; Jan. 25-27, 57; usual ground m.

Hobart, named on T map; low; savannah w etc.; based here Dec. 7, 56 to Feb. 23, 57; specimens labeled "*v.* Hobart" are from *v.* city south to *v.* Kingston, by usual ground m, bark.

Mt. Wellington, T7; to *c.* 4000 ft.; sclerophyll f approaching rain f in gullies (but altered by burning), open grass near summit; several visits Dec. 56 to Feb. 57; usual ground m (collecting poorer than formerly, probably because of fires in last few decades).

Arve River, T6; low; wet sclerophyll f with gigantic eucalypts, rain f with *Nothofagus;* Dec. 20-26, 56; usual ground m, especially drowning debris from ground around bases of big trees in forest.

Hartz Mt., T5; to *c.* 4000 ft.; wet sclerophyll f and heavy rain f (fine *Nothofagus*) on slopes, moors and stone above *c.* 3000 ft.; Feb. 8-10, 57; usual ground m.

Hastings, T4; low; sclerophyll f; Dec. 26, 56, Feb. 10-12, 57; little collecting, but good things under logs, boards in second growth along old logging road.

Ida Bay Cave, T3; low; wet cave, opening in sclerophyll f; Dec. 27, 56, Feb. 13, 57; cave collecting, and logs, streamside near cave mouth.

Catamaran, T2; low; wet sclerophyll f; Dec. 28-29, 56; logs etc.

Cockle Creek, T1; low; wet sclerophyll f; Dec. 28, 56; logs, stones, treading small swampy pond.

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